VOL. 7, NO. 24
December 31, 1982

Energy Research Abstracts

ABSTRACTS 62569-63866

Technical Information Center
UNITED STATES DEPARTMENT OF ENERGY

CURRENT AWARENESS PUBLICATIONS ON ENERGY

To provide complete coverage of literature related to major Department programs, announcement publications that are comprehensive in their coverage of certain energy fields are issued regularly. All information in these publications, plus additional backup information, is included in the Energy Data Base of the Technical Information Center; all references are also available for machine searching via the on-line retrieval system, DOE/RECON, and the commercial on-line retrieval systems. Descriptions of these current awareness publications, which are supported either directly or indirectly by the DOE, appear below. Department of Energy components may receive the listed publications free from the Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830. Telephone (615) 576-1303; (FTS) 626-1303.

PUBLICATIONS OF THE TECHNICAL INFORMATION CENTER

Energy Abstracts for Policy Analysis (EAPA)

A monthly abstract journal devoted to the analysis of energy research, conservation, and policy. Scope and coverage are limited to substantive articles or reports and emphasize the following: programmatic efforts; legislative, regulatory, and other legal aspects; social, economic, and environmental impacts; regional and sectoral analyses; institutional factors, etc. *EAPA* is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402; domestic subscribers $6.00, foreign $7.50 per copy; annual cumulative index, domestic $10.00, foreign $12.50 per copy. The annual subscription price is $70.00 for domestic subscribers and $87.50 for foreign subscribers.

Energy Research Abstracts (ERA)

A comprehensive semimonthly abstract journal devoted to all areas of energy-related information produced by the Department of Energy, other U. S. government organizations, and foreign governments. *ERA* is available to the public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The subscription rate for the 24 semimonthly issues is $150.00 for domestic subscribers and $187.50 for foreign subscribers. A single issue costs $6.50 (domestic) or $8.15 (foreign).

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Nuclear Fuel Cycle (NFC)

A semimonthly current awareness bulletin covering all aspects of the nuclear fuel cycle, both front end and back end. Available as PB82-913400.

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A semimonthly current awareness bulletin covering the following management aspects: transport and storage, waste processing, waste disposal, waste storage, radioactive effluents, and shipping containers. Available as PB82-902900.

INTERNATIONAL ENERGY PUBLICATIONS

Atomindex (Published in cooperation with the Technical Information Center by the International Atomic Energy Agency, International Nuclear Information System, Vienna, Austria)

A semimonthly abstract journal devoted to information on nuclear science and technology. Through an exchange agreement, IAEA/INIS provides all non-U. S. nuclear information of *Atomindex* to TIC for inclusion in the Energy Data Base; in turn, TIC provides all U. S. nuclear information to IAEA/INIS for inclusion in *Atomindex*. *Atomindex* is available by subscription from UNIPUB, 345 Park Avenue South, New York, NY 10010. The cost of an annual subscription, 24 semimonthly issues and semiannual and annual cumulative indexes, is $290.

Coal Abstracts (Published in cooperation with the Technical Information Center by the International Energy Agency, IEA Coal Research, London, England)

A monthly abstract journal devoted to information on coal. Through an exchange agreement, IEA Coal Research provides non-U. S. coal information of *Coal Abstracts* to TIC for inclusion in the Energy Data Base; in turn, TIC provides all U. S. coal information to IEA Coal Research for inclusion in *Coal Abstracts*. *Coal Abstracts* is available to Department of Energy components and contractors from the Technical Information Center. Non-DOE organizations may obtain *Coal Abstracts* from IEA Coal Research, Technical Information Service, 14-15 Lower Grosvenor Place, London SW1W 0EX, England, for 100 pounds sterling per year.

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ENERGY RESEARCH ABSTRACTS

ABOUT THE TECHNICAL INFORMATION CENTER

The Technical Information Center in Oak Ridge, Tennessee, has been the national center for scientific and technical information for the Department of Energy (DOE) and its predecessor agencies since 1946. In developing and managing DOE's technical information program, the Center places under bibliographic control not only DOE-originated information but also worldwide literature on scientific and technical advances in the energy field and announces the source and availability of this information. Whereas the literature of science is emphasized, coverage is extended to DOE programmatic, socioeconomic, environmental, legislative/regulatory energy analysis, and policy-related areas. To accomplish this mission, the Center builds and maintains computerized energy-information data bases and disseminates this information via computerized retrieval systems and announcement publications such as abstracting journals, bibliographies, and update journals. Direct access to the Center's most comprehensive data base, the Energy Data Base, is available to the public through commercial on-line bibliographic retrieval systems. The Energy Data Base and many of the Center's energy-related data bases are available to DOE offices and contractors and to other government agencies via DOE/RECON, the Department's on-line information retrieval system. The Center has developed and maintains systems to record and communicate energy-related research-in-progress information, to catalog official DOE issue-and-policy documents, to maintain a register of DOE public communications publications, to track research report deliverables from DOE contractors, and to test and make available DOE-funded computer software programs with scientific and management applications. The Center also maintains a full-scale publishing capability to serve special publication needs of the Department. To effectively manage DOE's technical information resources, the Center's program is one of continual development and evaluation of new information products, systems, and technologies.

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ABOUT *ENERGY RESEARCH ABSTRACTS*

Energy Research Abstracts (ERA) provides abstracting and indexing coverage of all scientific and technical reports, journal articles, conference papers and proceedings, books, patents, theses, and monographs originated by the U. S. Department of Energy, its laboratories, energy centers, and contractors. *ERA* also covers other energy information prepared *in report form* by federal and state government organizations, foreign governments, and domestic and foreign universities and research organizations. The user should remain aware that *ERA* coverage of non-report literature is limited to that generated by Department of Energy activity.

ERA is comprehensive in its subject scope, encompassing the DOE's research, development, demonstration, and technological programs resulting from its broad charter for energy sources, supplies, safety, environmental impacts, and regulation.

ERA is available on an exchange basis to universities, research institutions, industrial firms, and publishers of scientific information. Inquiries should be directed to the Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37830.

ERA is available to the public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The subscription rate for the 24 semimonthly issues is $150.00 for domestic subscribers and $187.50 for foreign subscribers. A single issue costs $6.50 (domestic) or $8.15 (foreign). The cumulative indexes will be available in microfiche form only. The microfiche may be purchased from the National Technical Information Service, U. S. Department of Commerce, Springfield, Virginia 22161 and from Engineered Systems, P. O. Box 866, Oak Ridge, Tennessee 37830.

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• ABSTRACTS IN *ENERGY RESEARCH ABSTRACTS*

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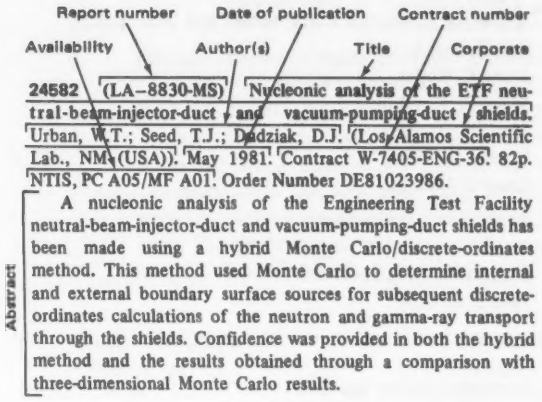
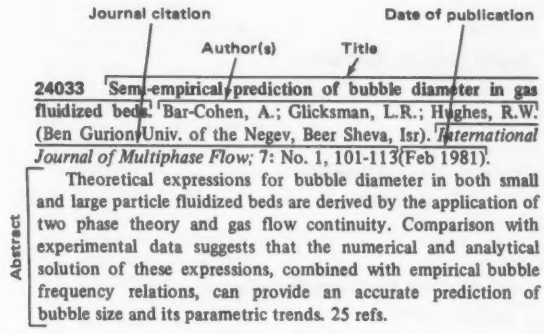

Report number
Date of publication
Contract number
Availability
Author(s)
Title
Corporate
24582 (LA–8830-MS) Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields. Urban, W.T.; Seed, T.J.; Dudziak, D.J. (Los Alamos Scientific Lab., NM (USA)). May 1981. Contract W-7405-ENG-36. 82p. NTIS, PC A05/MF A01. Order Number DE81023986.
Abstract
A nucleonic analysis of the Engineering Test Facility neutral-beam-injector-duct and vacuum-pumping-duct shields has been made using a hybrid Monte Carlo/discrete-ordinates method. This method used Monte Carlo to determine internal and external boundary surface sources for subsequent discrete-ordinates calculations of the neutron and gamma-ray transport through the shields. Confidence was provided in both the hybrid method and the results obtained through a comparison with three-dimensional Monte Carlo results.


Journal citation
Date of publication
Author(s)
Title
24033 Semi-empirical prediction of bubble diameter in gas fluidized beds. Bar-Cohen, A.; Glicksman, L.R.; Hughes, R.W. (Ben Gurion Univ. of the Negev, Beer Sheva, Isr). International Journal of Multiphase Flow; 7: No. 1, 101-113 (Feb 1981).
Abstract
Theoretical expressions for bubble diameter in both small and large particle fluidized beds are derived by the application of two phase theory and gas flow continuity. Comparison with experimental data suggests that the numerical and analytical solution of these expressions, combined with empirical bubble frequency relations, can provide an accurate prediction of bubble size and its parametric trends. 25 refs.

• INDEXES TO *ENERGY RESEARCH ABSTRACTS*

Five indexes are provided for approaching the contents of each issue of *Energy Research Abstracts (ERA)*. Each index is preceded by an introduction that details the organization of the index and the principles by which it was compiled. The reader is referred to these introductions for information not found in the index examples that follow.

• Corporate Author Index

Technical report literature is indexed using the name of the organization or institution responsible for the issuance of the report.

24582 (LA–8830-MS) Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields. Urban, W.T.; Seed, T.J.; Dudziak, D.J. **(Los Alamos Scientific Lab., NM (USA)).** May 1981. Contract W-7405-ENG-36. 82p. NTIS, PC A05/MF A01. Order Number DE81023986.

is indexed as:

Los Alamos Scientific Lab., NM (USA)
Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 (LA–8830-MS)

• Personal Author Index

Each author's name is indexed in the form appearing on the document abstracted, with the exception that given names are reduced to initials:

Bar-Cohen, A., Semi-empirical prediction of bubble diameter in gas fluidized beds, 7:24033
Dudziak, D.J., *See* Urban, W.T., 6:24582
Glicksman, L.R., *See* Bar-Cohen, A., 7:24033
Hughes, R.W., *See* Bar-Cohen, A., 7:24033
Seed, T.J., *See* Urban, W.T., 6:24582
Urban, W.T., Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 (LA–8830-MS)

• Subject Index

The subject index consisting of entries naming specific materials, objects, and processes is arranged alphabetically. Document titles or informative phrases, or both, specific to these entries are arranged alphabetically under the entries.

TOKAMAK ETF
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Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 (LA–8830-MS)
Neutron Transport
Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 (LA–8830-MS)

• Contract Number Index

DOE technical literature is indexed using contract numbers under which the literature was produced. This index contains the contract number with corresponding abstract and report numbers.

W-7405-ENG-36	**Los Alamos National Lab., NM (USA)**	
	6:24582	LA–8830-MS

• Report Number Index

Technical report literature is also indexed using report numbers. This index includes information on where individual reports may be obtained. Patents and conference papers are indexed here as a matter of convenience. When a report is supplied under an Order Number, that number is included in the availability statement. An Order Number-Report Number Correlation is included for convenience.

LA–		
8830-MS	6:24582	NTIS, PC A05/MF A01. Order Number DE81023986, Distribution Category STD-20d

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SUBJECT CONTENTS (NUMERICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts.* The following listing includes the totality of the 40 first-level and 294 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semimonthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope notes is available as DOE/TIC-4584-R4 from NTIS for $7.00.

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SUBJECT CONTENTS (ALPHABETICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts*. The following listing includes the totality of the 40 first-level and 294 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semimonthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope notes is available as DOE/TIC-4584-R4 from NTIS for $7.00.

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS
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ENERGY RESEARCH ABSTRACTS

01 COAL AND COAL PRODUCTS

REFER ALSO TO CITATION(S) 63127

0104 Processing

REFER ALSO TO CITATION(S) 62622, 62641, 62684, 62806, 62958, 62959, 62960, 62960, 63260

62569 (BMFT-FB-T—82-018) Oxygen supply for coal gasification power stations (combined cycle process). Rottmann, D.; Schoenpflug, E. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Jan 1982. 66p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750503.

1. Present status: Final investigation to the problem of adaption of air separation processes to coal gasification plants. Main points are the start up and the load change behaviour of the total process. 2. Aim of the study is the estimation of air separation processes which provide oxygen to the combined cycle process. On the basis of a selected example the technical feasibility of such a plant is checked. The load change behaviour of the plant, the adaption of the coal gasification and the start up of the total system are investigated. 3. Methods: All processes which seem to be suitable for the production of oxygen are investigated in view of the energy consumption. The influence of process parameters on the energy consumption is calculated and discussed. The most economical air separation processes are investigated in detail. 4. Result: The investigation shows that a low pressure plant with mixed heat exchangers and a medium pressure plant with molsieves are the most economical processes. 5. Conclusion: It has been proven that air separation processes and their order of magnitude as required for this study can be constructed economically.

62570 (DOE/BC/10430—1) Coal/oil thixogel fuels for diesels. Zatko, J.R.; Twesme, E.N.; Tarpley, W.B. Jr. (Energy and Minerals Research Co., Exton, PA (USA)). Sep 1982. Contract AC19-81BC10430. 35p. NTIS, PC A03/MF A01. Order Number DE83000398.

Previous work has demonstrated the stable suspension of particulate coal in thixotropically gelled fuel oil, with mixture integrity under continuous pumping and vibration shock. The program here reported was the first phase in developing a thixogel of particulate coal in oil, water or methanol as an alternate fuel for diesel engines. Diesel use requires ultrafine coal particles which are virtually ash-free and relatively sulfur-free. Ultrasonic grinding can efficiently produce ultrafine coal. The principal task remaining is to complete the ash removal process economically. This pursuit was the main project goal. Of the various physical cleaning methods investigated, comminution followed by selective agglomeration was most effective, reducing ash/sulfur contaminates up to 60%. By optimizing the laboratory methods of agglomeration, including the use of ultrasonic energy for selective coalescence and/or flow promotion, these techniques have the potential for virtually complete, economically feasible high-volume cleaning. It is also recommended that coals of differing compositions be evaluated in the thixotropic gel system, to determine if the differences indicate preferential coal type use. As an additional efficiency, the comminution/agglomeration process could be used with coal fines now discarded at the mine head. (Handling problems can be ameliorated since the fines can be mixed with the thixogelled liquid component of the fuel.) Thus it is anticipated that the various technologies will work together to enable a substantial substitution of coal for oil.

62571 (DOE/CH/10047—2) Process-verification report for Combustion Engineering/Gulf States Utilities coal-gasification demonstration plant. Andrus, H.E. Jr.; Koucky, R.W. (Combustion Engineering, Inc., Windsor, CT (USA). Power Systems Group). Jan 1981. Contract AC02-80CH10047. 121p. NTIS, PC A06/MF A01. Order Number DE83000064.

Based on analysis of the Process Development Unit (PDU) data, the C-E Gasification Process has been verified in an air blown mode firing Pittsburgh Seam Coal. The major items in this report include a process description, a description of the gasifier computer model (GAS4), a description of the method of data analysis and a comparison of the PDU performance and the Process Verification Criteria. It is concluded that: (1) The PDU is capable of balanced operation (no net char production) and good gas quality. (2) Gas quality depends on heat absorption by water cooled walls; therefore, heating value increases with larger gasifier size. (3) Successful experience with studded water wall construction has been demonstrated. (4) All Process Verification Criteria has been met, including free burn of low Btu gas. (5) Significant parameters, heat absorption, carbon conversion, gas kinetics, and their interrelationship, have been determined with the PDU data. (6) A computer model, GAS4, has been developed and calibrated to predict gasifier performance. (7) The heating value of the coal is converted to energy in the product gas and steam. Energy conversion is 96% or higher, with losses only in the ash and the small amount of sensible energy not recoverable from the gas. Thus, the overall conclusions are that the CE atmospheric entrainment gasification process is technically viable and a firm basis has been provided for the design of a demonstration plant.

62572 (DOE/CS/40283—T1) Materials research for the clean utilization of coal. Quarterly progress report, April-June 1982. Schneider, S.J. (National Bureau of Standards, Washington, DC (USA). Center for Materials Science). 1982. Contract AC01-77CS40283. 6p. NTIS, PC A02/MF A01. Order Number DE82021617.

Progress is reported in two areas: materials performance and properties, and creep and related properties of refractories. Data are summarized for the creep failure and modulus of rupture of AZS (alumina-zirconia-silica) at temperatures up to 1400°C. (DLC)

62573 (DOE/ET/10154—110) Operation of the Wilsonville Advanced Coal-Liquefaction R & D Facility, Wilsonville, Alabama. Quarterly technical progress report, July-September 1981. (Southern Co. Services, Inc., Birmingham, AL (USA); Catalytic, Inc., Wilsonville, AL (USA)). Aug 1982. Contract AC22-76ET10154. 188p. NTIS, PC A09/MF A01. Order Number DE83000110.

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This report summarizes the operating conditions and test results which were obtained during the third quarter of 1981 at the six ton per day Advanced Coal Liquefaction R & D Facility in Wilsonville, Alabama. The SRC unit operated for approximately 70% of the period with scheduled shutdowns accounting for more than 20% of the downtime. Kentucky 9 coal from the Fies mine was processed during all runs. Potential process improvements and tests were evaluated in the respective process units. In the SRC Unit: Evaluation of low severity reactor conditions for two-stage liquefaction; evaluation of the V103 High Pressure Separator in the hot separator mode of operation at low severity reaction conditions; and investigation of the correlation between dissolver operating conditions and hydrogen leakage. In the CSD Unit: Off-line steam stripping of SRC to reduce DAS losses. In the HTR Unit: Performance evaluation of the unit at various reactor temperatures;

and estimation of catalyst deactivation by duplicating previous run conditions after a given operating period.

62574 **(DOE/ET/10693—2295) Critical studies of the rapid pyrolysis and hydropyrolysis of coal. Final project report, January 1, 1977-June 30, 1982.** Howard, J.B.; Peters, W.A. (Massachusetts Inst. of Tech., Cambridge (USA)). Sep 1982. Contract AT01-76ET10693. 13p. (FE-MIT—2295T26). NTIS, PC A02/MF A01. Order Number DE83000101.

This report summarizes major findings from a study of the effects of reaction conditions on the rapid pyrolysis behavior of coal in inert and hydrogen atmospheres. The independent effects of final temperature (150 to 1100°C), reaction time at final temperature (0 to 30 s), heating rate (10^3 to 10^4 °C/s), total pressure (0.0001 to 100 atm), hydrogen partial pressure (0 to 69 atm), and particle size (45 to 1000 μm), on product yields and compositions were determined for a Montana lignite and a Pittsburgh No. 8 Seam bituminous coal. Kinetic data were obtained for formation of specific pyrolysis products from each coal. A new mass transfer model for rapid hydrogasification of softening coal was also formulated. Effects of native mineral matter and selected inorganic additives on the pyrolysis behavior of the Pittsburgh Seam coal and of a Wyodak subbituminous coal were also studied. Detailed project findings are included in papers appended to the main body of the report. Important results include: (1) temperature and residence time are major parameters in determining pyrolysis and hydropyrolysis behavior; (2) coal type is also important, since major differences are observed in the yields, compositions, and evolution kinetics of products from rapid pyrolysis of the bituminous coal and of the lignite; (3) hydrogen can react rapidly with decomposing coal during the early stages of pyrolysis and, under conditions minimizing the elevated temperature contacting of hydrogen and pyrolysis tars, methane accounts for most of the resulting increased conversion; (4) secondary reactions of tar have a major role in determining product yields, compositions, and evolution kinetics in pyrolysis of the bituminous coal; and (5) increased CO production and decreased tar evolution are obtained by treating the bituminous coal with lime or calcite before pyrolysis.

62575 **(DOE/ET/11423—T5) Identification and cleavage of breakable single bonds by selective oxidation, reduction, and hydrolysis. Quarterly report No. 15, April 1-June 30, 1982.** Hirschon, A.S.; Zevely, J.; Mayo, F.R. (SRI International, Menlo Park, CA (USA)). Sep 1982. Contract AC22-78ET11423. 41p. NTIS, PC A03/MF A01. Order Number DE82021276.

Objective is to study the structure of bituminous coal. The program began with studies of the fraction of Illinois No. 6 coal that is toluene-insoluble, pyridine-soluble (TIPS). This report describes further investigations of TIPS fractions, the preparation of a new lot, their fractionation by gel permeation chromatography, and their oxidations by aqueous NaOCl and Ce(IV). It is shown that benzylamine dissolves only 1.3% of the carbon in pyridine-extracted coal in 5 extractions (4 h), but 7.3% in 16 days. A concentrated benzylamine extract was almost wholly soluble in pyridine. Increases in hydroxyl and amine groups when coal is extracted by N-containing solvents, are compared. Silylation of TIPS fractions soluble and insoluble in alcoholic KOH results in similar hydroxyl contents differing in molecular weight. Black acids were tested for diaryl ketone. A literature review indicates that in connecting links Ar-(CH_3)/sub n/-Ar in coal liquefaction, n should be 2 or more. Pyridine extractions of nine coals are summarized. 10 figures, 11 tables. (DLC)

62576 **(DOE/ET/13039—T1) Program documentation of DOE portfolio selection system for fossil demonstration plants.** Abell, A.A.; Smith, J.L. (Econergy, Inc., Los Angeles, CA (USA)). Jun 1979. Contract AC01-77ET13039. 53p. NTIS, PC A04/MF A01. Order Number DE82020081.

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A computer program is described to optimize its design, compare different processes by way of cost benefit analysis and to assess the risk involved in different coal gasification and coal liquefaction demonstration plant projects. (LTN)

62577 **(DOE/ET/14801—21) Gas/slurry flow in coal-liquefaction processes (fluid dynamics in 3-phase-flow column). Quarterly technical progress report, 1 April 1981-30 June 1981.** Ying, D.H.S.; Moujaes, S.F.; Sivasubramanian, R.; Givens, E.N. (Air Products and Chemicals, Inc., Allentown, PA (USA)). Nov 1981. Contract AC22-79ET14801. 61p. NTIS, PC A04/MF A01. Order Number DE82018588.

This work is a continuation of studies initiated by Air Products and Chemicals, Inc. on the fluid dynamics of three-phase flow to support the design of the 6000 T/D dissolver for the SRC-I demonstration plant which began in July 1978. The 6000 T/D SRC-I demonstration plant will employ verticle tubular reactors feeding slurry and gas concurrently upward through these vessels. In the SRC-I design this reactor is essentially an empty vessel with only a distributor plate located near the inlet. Because the commercial plant represents a considerable scale-up over either Wilsonville or Ft. Lewis, this program is addressing the need for additional data on the behavior of three phase systems in large vessels. Parameters being investigated in this program are being studied at conditions that relate directly to the projected demonstration plant operating conditions. Air/water/sand three-phase flow systems in both a 5-inch diameter and a 12-inch diameter column is used under Tasks 2, 3 and 4 in this cold-flow simulator study program. Tetralin was the organic fluid chosen to be investigated under Task 5 of this program. The objective of using Tetralin and glycol mixtures as organic fluids was to study the effect of fluid properties on the three-phase system. Surface tension and viscosity were the main physical properties of interest in this study. During this quarter gas holdup, solids distribution and axial liquid dispersion coefficients were measured.Results show that the gas holdup is not changed considerably by the presence of solids. The gas holdup was also affected by the fluid properties such as liquid viscosity and surface tension. Results show consistently for ethylene glycol mixtures that the ratio of particle terminal velocity to the dispersion coefficient (V/sub p//E/sub zp/) is higher with larger particle size. These results were confirmed in both water and tetralin. 36 figures.

62578 **(DOE/MC/16024—T3) Gas characterization from fluidized-bed coal gasification. Third quarterly report, March 1-May 31, 1982.** Ciliberti, D.F.; Smeltzer, E.E.; Rohatgi, N.T.; Alvin, M.A.; Keairns, D.L.; Turner, A.B.; Lagonik, F.; Lojek, D. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Research and Development Center). 1982. Contract AC21-81MC16024. 43p. NTIS, PC A03/MF A01. Order Number DE82021179.

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The Westinghouse Electric Corporation proposed to characterize the nature of alkali, trace metal, particulate, and hydrocarbon emissions in the hot fuel gas stream produced in the Westinghouse fluidized bed gasifier. This program would be carried out to determine the potential environmental and process implications of these emissions. The characterization would consist of determining the amounts of contaminants associated with the particulate emissions relative to the amounts and types of gaseous species. The particulate-associated contaminants would be further analyzed to determine their soluble and insoluble fractions as well as the particular species present. The primary method of sampling will be based on isokinetic extractive sampling. Upon analysis of the species and amounts of alkali, trace metal, and hydrocarbons found, attempts will be made to correlate the effects of feedstocks and operating parameters with these emissions. This will be used to develop a basis for projecting emission profiles in fluidized bed gasification processes. 16 figures, 13 tables.

62579 **(DOE/MC/16377—1245) Photoassisted electrolysis applied to coal gasification. Annual report, 1 July 1981-30 June 1982.** Park, S.M. (New Mexico Univ., Albuquerque (USA). Dept. of Chemistry). 1982. Contract AC21-81MC16377. 151p. NTIS, PC A07/MF A01. Order Number DE82021319.

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The literature search was completed on electrochemical oxidation/reductions of various carbons and chemical oxidations/reductions of coal. Various conclusions from this search are presented in the review. The oxidation mechanism of coal in electrolysis cells has been studied in detail. Results indicate that coal is catalytically

oxidized by iron(III) leached out in the acidic medium. Various other catalysts have also been studied and their reaction rate constants have been determined. Current efficiencies of the process as well as results from the FTIR studies are presented. Preliminary studies on photoassisted coal gasification reactions at n-SnO_2 and n-WO_3 electrode have been carried out and the results are reported. Also, methods of preparation of the semiconductor thin film on glasses were studied. Methods of studying the stability of semiconductor electrodes were established employing a rotating ring-disk electrode technique. The long-term stability of semiconductor electrodes would be needed to carry out the photoassisted coal gasification reaction. In the method we developed, the semiconductor was used as a disk electrode while the noble metal, e.g., Au or Pt, is used as a ring electrode. The species generated at the semiconductor electrode by light illumination is detected at the ring electrode by applying proper electrode potential. If the ring detection current is lower than its expected value, the disk may undergo the photocorrosion reaction.

62580 **(DOE/MC/16447—1239) Hypersorption process for separation of components of a medium -Btu gas. Final report.** (Dravo Engineers and Constructors, Pittsburgh, PA (USA)). 17 Jul 1982. Contract AC21-81MC16447. 133p. NTIS, PC A07/MF A01. Order Number DE83000577.

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This study has been performed to determine the technical and economic feasibility of employing hypersorption process technology to separate and purify a medium - Btu gas, derived from oxygen-blown gasifiers, to obtain a H_2/CO ratio of 2:1 as a feed to a Fischer-Tropsch type plant. Technical feasibility is a measure of the ability to design a hypersorption separation and purification process from available data. Economic feasibility can be made through comparisons with commercially available process technology. Three gasification processes have been used as a basis for this study. These processes are based upon EPRI Report AF-244 for the Lurgi moving bed, oxygen-blown, dry bottom gasifier, and EPRI Report AF-642 for the Texaco, slurry fed, oxygen-blown, entrained bed gasifier and for the Foster-Wheeler, oxygen-blown, entrained bed gasifier. Process designs for the hypersorption separation and purification for each case have been made using engineering judgments based on the available adsorption isotherms, which have been obtained from the Calgon Corporation. No attempt has been made to optimize these designs although some additional studies have been done where it has been deemed desirable. Cryogenic separation and acid gas purification for each case have been supplied by Lotepro as a packaged unit. Economic evaluations are ambiguous. All plant investments are within the +- 30% accuracy of this study. No clear cut choice between cryogenic separation - acid gas purification and hypersorptive separation - purification can be made based on plant investment. Operating costs are within the +- 30% accuracy. However, in the Foster-Wheeler case the operating costs are 28% greater for the hypersorption process. 12 figures, 42 tables.

62581 **(DOE/OR/03054—5) SRC-1 quarterly technical report, July-September 1981.** (International Coal Refining Co., Allentown, PA (USA)). 1981. Contract AC05-78OR03054. 335p. NTIS, PC A15/MF A01. Order Number DE82008479.

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This report is a collection of papers related to the design of the SRC-1 demonstration plant to be built near Newman, KY. The papers involve alternative design or trade off studies of individual sections of the plant, physical and chemical property measurements made to verify the design of other sections, equipment testing, waste water simulation and treatment studies, analytical laboratory planning, product studies (for marketing research), hydrogen production and purification, pilot plant suffort work, process simulation, and baseline ecology studies. Seventeen papers have been entered individually into EDB and ERA. (LTN)

62582 **(DOE/PC/30088—9) Coal-transformation chemistry. Ninth quarterly progress report.** Stock, L.M. (Chicago Univ., IL (USA)). 1982. Contract AC22-80PC30088. 36p. NTIS, PC A03/MF A01. Order Number DE82021344.

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The effort on donor solvent coal chemistry during this quarter concerned the factors that govern the cleavage of ethylene linkages in several representative compounds. The behavior of the resulting radicals were also studied. Bibenzyl, 1,2-di(1-naphthyl)ethane and 1,2-di(9-anthryl)ethane were selected as the reaction substrates. The latter two compounds have been synthesized and the catalytic effect of these compounds on the exchange reaction of diphenylmethane with tetralin-d_{12} at 400°C was examined. The results showed that the catalytic effect was in the order: 1,2-di(1-naphthyl)ethane → 1,2-di(9-anthryl)ethane → bibenzyl. Nuclear Overhauser effect (NOE) suppression in carbon nmr spectra of reductively alkylated coals is discussed. Suppression of NOE in ^{13}C-enriched alkylated coal samples does not result in a difference in carbon to oxygen alkylation ratios. However, for unenriched reductively alkylated coal samples, suppression of NOE is essential for accurate quantitative analysis. With NOE suppression, the carbon to oxygen alkylation ratios of reductively ethylated coal are consistent with previous results for reductively methylated and butylated Illinois No. 6 coal. The EPR spectra of Illinois No. 6 coal and several of its reductive alkylation products were studied. The EPR spectra of the hydrofuran soluble reaction products and the insoluble reaction products were each studied. There is a large decrease in the spin concentration in the reductive alkylation products in both the soluble and insoluble products. However, the insoluble materials which are, of course, relatively rich in inorganic compounds exhibit broad resonance bands extending to zero field. The substances responsible for these broad absorptions are readily removed by treatment with dilute hydrochloric acid. The materials treated in this way exhibit only a weak resonance at $g = 2$. 7 figures, 7 tables.

62583 **(DOE/PC/30293—7) Effects of preignition on pulverized-coal combustion. Seventh quarterly report, 1 April 1982-30 June 1982.** Simons, G.A.; Kothandaraman, G.; Schertzer, S.P.; Palm, M.J. (Physical Sciences, Inc., Andover, MA (USA)). 1982. Contract AC22-80PC30293. 60p. (PSI-TR—334). NTIS, PC A04/MF A01. Order Number DE82020516.

Task 1, pore structure optimization, is complete. The results of Task 1 predict that high reactivity chars require high porosities and a higher concentration of large pores. The experimental studies of Task 2 illustrate the dependence of these quantities on heating rate and final temperature. The data obtained for Texas Lignite suggest that porosity (hence reactivity) is strongly dependent on the final pyrolysis temperature with the maximum porosity occurring at 1300 K. The data also indicate that to a lesser extent, the heating rate affects pore structure. Higher heating rates increase the relative number of large pores and thus can enhance reactivity by a factor of two. Hence, the optimum pore structure for char reactivity may be obtained by preparing char at 1300 K and high heating rates (> 1000 K/s). Such chars could be four times as reactive as chars prepared at 2000 K and 1 to 10 K/s. The theory of pore evolution is complete and was reported. Potential mechanisms of pore evolution have been identified and described. For the most part, all mechanisms lead to the preservation of the 1/r/sub p/^{3} distribution. This is the statistically derived pore distribution function which originally lead to the pore tree. Experimental studies conducted under Task 2 support this conclusion. The model for the bulk growth of existing pores is used to describe volatile transport through the pores. This model is reported in Section 4. The pore tree structure sufficiently resists the flux of volatiles such that very large internal pressures develop. These internal pressures provide a good environment for gas phase collisions and secondary chemistry. Secondary chemistry is assessed under Task 4 in Sec. 5. Preliminary results suggest vast potential for secondary chemical reactions. 16 figures, 2 tables.

62584 **(DOE/PC/40005—20) Liquefaction of bituminous coals with added catalysts.** (Pittsburg and Midway Coal Mining Co., Shawnee Mission, KS (USA)). Sep 1982. Contract AC22-81PC40005;AC22-79ET14800. 94p. NTIS, PC A05/MF A01. Order Number DE83000309.

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Catalyst addition studies were carried out during SRC I and SRC II processing of bituminous coals from the Loveridge, Ayrshire, Blacksville No. 2, Powhatan No. 5 and Pyro Mines. While

these coals can generally be liquefied successfully in both modes of operation, the catalysts were added in an attempt to improve yields, product quality and operability. At 450°C, 2250 psig and 1.0 hour residence time in the SRC II mode with Loveridge coal, two hydrodesulfurization catalysts (NiMo and CoMo on alumina) and an ammonium molybdate emulsion increased total oil yield by 10 wt % (based on MF coal). Molybdenum added by aqueous impregnation of the coal, pyrite and ferric oxide each increased oil yield by about 6 wt %, while a ferrous sulfate emulsion had little effect. Distillate product analyses were not changed by the additives except for a reduction in sulfur with the molybdenum catalysts. There was a significant improvement in operability with all additives except the ferrous sulfate emulsion. Molybdenum added as an emulsion was an effective catalyst at concentrations as low as 0.05 wt %, based on MF coal. At 455°C, 1800 psig and 1.0 hour residence time in the SRC II mode with Loveridge coal, total oil yield was increased by 4 to 11-1/2 wt % (based on MF coal) by pyrite addition relative to the point where operation could no longer be sustained without additive. This range in yields was due to differences in the catalytic activity of three pyrite samples. Operation was generally satisfactory at these conditions with the iron additives whereas it was impossible without added catalyst. Iron oxide additive was much less effective than pyrite at the lower pressure but was nearly equivalent at 2250 psig. The Indiana VI seam coal (Ayrshire) was much more responsive to pyrite addition than the Pittsburgh seam coals (Loveridge, Blacksville No. 2 and Powhatan).

62585 **(DOE/PC/40799—T3) Heteroatom speciation in coal liquefaction via FT-IR coupled with liquid chromatography. Quarterly progress report, April 1, 1982-June 30, 1982.** Taylor, L.T. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA)). Sep 1982. Contract FG22-81PC40799. 31p. NTIS, PC A03/MF A01. Order Number DE82021728.

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In this report results which have evolved from an evaluation of HPLC coupled with Fourier Transform Infrared Spectrometry (FTIR) employing semi-preparative, analytical and microbore separation are discussed. Model mixtures of numerous aliphatic and aromatic hydrocarbons have been separated on silica gel. In an attempt to identify some of the nonpolar constituents in several coal liquefaction process solvents and jet fuels, optimized HPLC-FTIR has been employed in the normal phase mode with Freon-113 elution. HPLC-FTIR can be a valuable tool in complex mixture analysis. Limitations on solvent windows can be partially overcome by decreasing the cell pathlength if the component concentrations can be increased. This study has shown the feasibility of microbore HPLC-FTIR as a routine tool, which allows the chromatographer to use solvents with large infrared windows which were previously not considered because of their high cost. As the state-of-the-art of microbore column technology increases, the better separations that are expected will be readily amenable to FTIR detection. 12 figures, 2 tables.

62586 **(IITRI-M—06043-16) Design, engineering and evaluation of refractory liners for slagging gasifiers. Final report.** deTineo, B.J.; Booth, G.; Firestone, R.F.; Greaves, M.J.; Hales, C.; Lamoureux, J.P.; Ledford, R.R. (IIT Research Inst., Chicago, IL (USA)). Aug 1982. Contract AC05-78ET13410. 357p. NTIS, PC A16/MF A01. Order Number DE82021029.

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The contract for this program was awarded at the end of September 1978. Work was started on 1 October 1978, on Tasks A, B, and E. Task A, Conceptual Liner Designs, and Task B, Test System Design and Construction, were completed. Task C, Liner Tests, and Task D, Liner Design Evaluation, were to begin upon completion of Task B. Task E, Liner Model Development, is inactive after an initial data compilation and theoretical model development effort. It was to be activated as soon as data were available from Task D. Task F, Liner Design Handbook, was active along with Task A since the reports of both tasks were to use the same format. At this time, Tasks C, D, and F are not to be completed since funding of this project was phased out by DOE directive. The refractory text facility, which was constructed, was tested and found to perform satisfactorily. It is described in detail, including a hazard analysis which was performed. (LTN)

62587 **(MIT—R82-44) Thermomechanical behavior of refractory-concrete-lined vessels.** Tseng, T.M. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Civil Engineering). Aug 1982. Contract W-7405-ENG-26. 381p. NTIS, PC A17/MF A01. Order Number DE83000202.

A constitutive model applicable to dense and insulating refractory concretes used for coal gasification vessel linings is developed. Experiments were performed on refractory concrete plate specimens subjected to biaxial compression at various temperatures. Based on the test results, an orthotropic model is then developed. A temperature-dependent creep model based on the concept of thermorheologically simple material is also developed. The creep strain consists of a transient delayed elastic component and a nonlinear flow component. The developed constitutive model has been incorporated in a three-dimensional finite-element program to perform thermal stress analysis. To determine the temperature distributions as input to the stress analysis, a predictive model is developed for transient heat transfer analysis of structures with layered heterogeneous media. To allow for the effects of high conductivity of the media, an effective conductivity model is developed. Verification of the developed thermomechanical analysis is made through simulation runs for large-scale experimental gasifier vessels. The model is then used to perform parameter studies. The effect of heating rate, cooling rate, hold periods, shrinkage value, and thickness of the lining are studied. Design recommendations are made to improve the mechanical reliability of refractory concrete lined coal gasification vessels.

62588 **(NP—2906147) Investigations into the adsorption of hydrogen, carbon monoxide and ethylene on reduced iron and manganese oxide as well as of their mixture.** Lohrengel, G. (Bochum Univ. (Germany, F.R.). Abt. Chemie). 1980. 225p. (In German). NTIS (US Sales Only), PC A10/MF A01. Order Number DE82906147.

Thesis (Ph.D.).

The interaction of carbon monoxide, hydrogen and ethylene (as intermediate and end product of the synthesis) with the contact was investigated under conditions approaching those of the true Fischer-Tropsch synthesis (temperatures up to 350°C, pressures to 40 bar) and with a hydrogen-reduced mixture of iron and manganese oxide as model catalyst. Adsorption behaviour and adsorption states on the surface of the catalysts were investigated regarding single components as well as their mixtures. The kinetics of the adsorption or desorption were set up under different conditions, amongst these the pretreatment or precharging of the catalyst materials. Knowledge was also gained on the behaviour of the oxides and their mixtures when reducing with hydrogen (initial temperature, degree of reduction) and the effects of reduction and adsorption on the catalyst structure.

62589 **(PB—81-219594) Vapor-phase cracking and wet oxidation as potential pollutant control techniques for coal gasification. Final report, Nov. 1976 - Apr. 1981.** Mcmichael, W.J.; Gangwal, S.K.; Green, D.A.; Mixon, F.O. (Research Triangle Inst., Research Triangle Park, NC (USA)). Jun 1981. 56p. NTIS, PC A04/MF A01.

Bench-scale experiments were used to deterimine rates of hydrocracking and wet oxidation as a function of process conditions and catalyst used. A microreactor system, capable of holding 1.0 cc of material to be screened for catalytic activity, was used in the hydrocracking studies. Benzene and alkylated benzene compounds were used as model compounds in determining the potential of various materials fo cracking rates. Thiophene was used as a model compound for catalyst poisoning studies. Cracking rates were determined for coal-derived materials produced from bituminous and subbituminous coals and materials containing iron and nickel compounds.

62590 **(SAND—82-1829) Coal-liquefaction preheater coking. Quarterly report, April 1-June 30, 1982.** Chapman, R.N. (Sandia National Labs., Albuquerque, NM (USA)). Aug 1982. Contract AC04-76DP00789. 13p. NTIS, PC A02/MF A01. Order Number DE83000549.

This quarterly report discusses activities in Sandia's program on coal liquefaction preheater coking. The objective of the program is to recommend novel preheater design and operational concepts that exhibit the potential for reducing the occurrence of carbonaceous material deposition on tube walls. During this period, the SRC-I pilot plant at Wilsonville, AL, was visited to collect process data and interview operators concerning operation and performance of the coal slurry preheater. Sufficient data have been collected to analyze preheater operations during the period of December 31, 1978 to August 3, 1979. A design for a high pressure, high temperature batch reactor/rheometer has been developed and an ambient pressure, temperature prototype is being built. The concept of operating the preheater in the slurry only mode (i.e., no gas phase feed) has been investigated with regard to the impact on rate of heat transfer, operability and unit size.

62591 **Coal pyrolysis for substitute petroleum and for low-cost power plant solid fuel.** Falkenberry, H.L. (DOE, Washington, DC 20545). *Transactions of the American Nuclear Society;* **39**: 5-6(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

62592 **(DOE/OR/20717—1-Exec.Summ.) Breckinridge Project, initial effort.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 32p. NTIS, PC A03/MF A01. Order Number DE83000177.

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This report presents an overview of the Breckinridge Project and summarizes the results achieved during the development phase of the project performed under a Cooperative Agreement with the United States Department of Energy. The Breckinridge Project provides for the design, construction and operation of a 50,000 barrel per day coal liquefaction facility in Breckinridge County, Kentucky. The development of the basic technology used in the Breckinridge Project dates back to the late 1950's and the invention by Hydrocarbon Research, Inc., (HRI) of the ebullated-bed reactor and the H-OIL process. The H-COAL process is based on the H-OIL technology. This coal liquefaction process produces clean low-sulfur petroleum substitutes suitable for most types of hydrocarbon-based fuel and chemical uses regardless of the sulfur content of the coal. A large H-COAL Pilot Plant in operation at Catlettsburg, Kentucky, is converting 220 tons of coal per day into 600 barrels of distillate products by catalytic hydrogenation. The estimated capital cost of the commercial facility is $3.17 billion, and the associated out-of-pocket operating cost is $18 per barrel, both in January 1981 dollars. Financial analysis shows the project to be an attractive investment under certain leveraged conditions which are possible through the assistance of the Synthetic Fuels Corporation. Ashland Synthetic Fuels, Inc. is currently working with the Synthetic Fuels Corporation and potential partners to develop financing for the commercial venture. Critical permits are being obtained and an Environmental Impact Statement is being prepared pursuant to initiating site preparation in early 1983. Commercial operations are expected to start up in early 1988.

62593 **(DOE/OR/20717—2) Breckinridge Project, initial effort. Report II. Breckinridge Project design basis.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 156p. NTIS, PC A08/MF A01. Order Number DE83000171.

The Breckinridge Project is a pioneer endeavor involving the engineering, construction, and operation of a commercial facility that will convert 23,000 tons per day of run-of-mine, high-sulfur coal into 50,000 barrels per day of liquid hydrocarbons equivalent to those produced from crude oil. The Initial Effort, now complete, was executed under Cooperative Agreement No. DE-FC05-80OR20717 between the Department of Energy and the Participants, Ashland Synthetic Fuels, Inc., and Airco Energy Company, Inc. The Initial Effort produced a preliminary design, capital estimate, and economic analysis of the commercial plant, as well as a plan for the design, construction, and operation of that plant. The extensive and rigorous attention given to environmental, socioeconomic, safety, and health considerations is indicative of the high priority these issues will continue to receive throughout the life of the project. The Breckinridge Energy Company, a partnership of several major corporations, is being formed to finance, own, and manage the Breckinridge Project. Report II is intended for the reader who is primarily interested in less detailed discussion of the coal liquefaction process and Breckinridge facility than presented in the eleven volumes of Reports IV and V. The overview section describes the project goals and briefly introduces the coal liquefaction process. The report continues with a discussion of the history of the project and the H-COAL process from its concept to the proposed commercialization technology. The report describes the site, the Breckinridge Facility, and concludes with a summary of the eleven reports that contain the deliverable documentation of the Initial Effort or Development Phase of the project.

62594 **(DOE/OR/20717—3-Vol.1) Breckinridge Project, initial effort.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 677p. NTIS, PC A99/MF A01. Order Number DE83000185.

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Report III, Volume 1 contains those specifications numbered A through J, as follows: General Specifications (A); Specifications for Pressure Vessels (C); Specifications for Tanks (D); Specifications for Exchangers (E); Specifications for Fired Heaters (F); Specifications for Pumps and Drivers (G); and Specifications for Instrumentation (J). The standard specifications of Bechtel Petroleum Incorporated have been amended as necessary to reflect the specific requirements of the Breckinridge Project, and the more stringent specifications of Ashland Synthetic Fuels, Inc. These standard specifications are available to the Initial Effort (Phase Zero) work performed by all contractors and subcontractors. Report III, Volume 1 also contains the unique specifications prepared for Plants 8, 15, and 27. These specifications will be substantially reviewed during Phase I of the project, and modified as necessary for use during the engineering, procurement, and construction of this project.

62595 **(DOE/OR/20717—3-Vol.2) Breckinridge Project, initial effort. Report III, Volume 2. Specifications.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 502p. NTIS, PC A22/MF A01. Order Number DE83000184.

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Report III, Volume 2 contains those specifications numbered K through Y, as follows: Specifications for Compressors (K); Specifications for Piping (L); Specifications for Structures (M); Specifications for Insulation (N); Specifications for Electrical (P); Specifications for Concrete (Q); Specifications for Civil (S); Specifications for Welding (W); Specifications for Painting (X); and Specifications for Special (Y). The standard specifications of Bechtel Petroleum Incorporated have been amended as necessary to reflect the specific requirements of the Breckinridge Project and the more stringent specifications of Ashland Synthetic Fuels, Inc. These standard specifications are available for the Initial Effort (Phase Zero) work performed by all contractors and subcontractors.

62596 **(DOE/OR/20717—4-Vol.1) Breckinridge Project, initial effort.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 503p. NTIS, PC A22/MF A01. Order Number DE83000192.

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Report IV, Volume 1 provides descriptions, data, and drawings pertaining to Coal Receiving and Storage (Plant 26), Coal Washing (Plant 27), and Coal Drying and Pulverization (Plant 1). Coal Receiving and Storage (Plant 26) receives raw, run-of-mine coal, and then unloads, stores, blends if necessary, and supplies the coal as required to Coal Washing (Plant 27). Coal Receiving and Storage collects the two grades of washed coal from Coal Wash-

ing, and then stores, blends, and delivers the washed coal to Coal Drying and Pulverization (Plant 1). In addition, Coal Receiving and Storage performs inventory and quality control functions. Coal Washing (Plant 27) receives raw coal from Coal Receiving and Storage (Plant 26) and processes the coal to remove ash, producing a washed coal low in ash content, a washed coal with medium ash content, and a waste product consisting of both coarse and fine ash. Coal Drying and Pulverization (Plant 1) receives washed coal from either Coal Receiving and Storage (Plant 26) or Coal Washing (Plant 27) and then simultaneously dries and pulverizes the coal. The dried, pulverized product is then delivered to Coal Slurry Preparation (Plant 2, described in Report IV, Volume 2).

62597 **(DOE/OR/20717—4-Vol.2) Breckinridge Project, initial effort.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 420p. NTIS, PC A18/MF A01. Order Number DE83000255.

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Report IV, Volume 2 provides descriptions, data, and drawings pertaining to Coal Slurry Preparation (Plant 2), H-COAL Preheating and Reaction (Plant 3), and H-COAL Primary Separation (Plant 4). Coal Slurry Preparation (Plant 2) receives dried and pulverized coal from Coal Drying and Pulverizing (Plant 1) and prewets and slurries the coal with recycle heavy distillate and hydroclone overflow. The coal slurry is then transported to H-COAL Preheating and Reaction (Plant 3) for liquefaction. H-COAL Preheating and Reaction (Plant 3) preheats the coal slurry from Coal Slurry Preparation (Plant 2), and pumps the preheated coal slurry to the reactor, which accomplishes the liquefaction by an ebullating bed process. The resulting reactor effluent slurry is transported to H-COAL Primary separation (Plant 4) for further processing. H-COAL Primary Separation (Plant 4) receives the liquefied coal slurry from H-COAL Preheating and Reaction (Plant 3) at an intermediate - pressure flash level, and hydrogen and light gases are flashed, cooled, and water washed before being fed to the Gas Plant (Plant 7). The liquid coal slurry is transported to H-COAL Recycle Slurry Preparation (Plant 5). The following information is included for each of the three plants: a description of the plant's process design, including, as applicable, the utility balance, catalysts and chemicals usage, heat and material balance, and a process flow diagram; an equipment list, including item numbers and descriptions; data sheets and sketches for major plant components; and pertinent engineering drawings. An appendix contains: an overall site plant showing the locations of all plants; and the symbols and legend for the piping and instrument diagrams included in this volume.

62598 **(DOE/OR/20717—4-Vol.3) Breckinridge Project, initial effort.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 422p. NTIS, PC A18/MF A01. Order Number DE83000189.

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Report IV, Volume 3, provides descriptions, data, and drawings pertaining to H-COAL Recycle Slurry Preparation (Plant 5), H-COAL Recycle Hydrogen Compression (Plant 6), and H-COAL Distillate Separation (Plant 17). H-COAL Recycle Slurry Preparation (Plant 5) receives a slurry stream from H-COAL Primary Separation (Plant 4), and then pumps the slurry through hydrocyclones, producing two slurry streams. One, dilute in solids is recycled back to the reactor. The other, concentrated in solids, is further processed to recover liquid products and is then transferred to Gasification and Purification (Plant 12). H-COAL Recycle Hydrogen Compression (Plant 6) compresses and recycles back to the reactor system hydrogen-rich vapor from H-COAL Primary Separation (Plant 4). This recycling maintains a hydrogen partial pressure and gas flow through the reactor vessel. H-COAL Distillate Separation (Plant 17) processes products from H-COAL Primary Separation (Plant 4) and H-COAL Recycle Slurry Preparation to produce light naphtha for the Gas Plant (Plant 7), middle and heavy distillates for tank farms, and heavy naphtha for Naphtha Hydrotreating and Reforming (Plant 18). The following information is included for each of the three plants: a description of the plant's process design, including the utility balance, heat and material balance (if applicable), and a process flow diagram; an equipment list, including item numbers and descriptions; data sheets and sketches for major plant components; and pertinent engineering drawings. An appendix contains: an overall site plan showing the locations of all plants; and the symbols and legend for the piping and instrument diagrams included in this volume.

62599 **(DOE/OR/20717—4-Vol.4) Breckinridge Project, initial effort.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 348p. NTIS, PC A11/MF A01. Order Number DE83000188.

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Report IV, Volume 4, provides descriptions, data, and drawings pertaining to the Gas Plant (Plant 7). The Gas Plant (Plant 7) receives feed gas streams from various process plants. The Gas Plant compresses, treats, and fractionates the gas streams into intermediate and final products. The following information is included for the plant described in this volume: a description of the plant's process design, including the utility balance, catalysts and chemicals usage, and process flow diagrams; an equipment list, including item numbers and descriptions; data sheets and sketches for major plant components; and pertinent engineering drawings. An appendix contains: an overall site plan showing the locations of all plants; and the symbols and legend for the piping and instrument diagrams included in this volume.

62600 **(DOE/OR/20717—4-Vol.5) Breckinridge Project, initial effort.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 262p. NTIS, PC A12/MF A01. Order Number DE83000191.

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Report IV, Volume 5, provides descriptions, data, and drawings pertaining to Cryogenic Hydrogen Purification (Plant 8), Sour Water Treating (Plant 9), and the Sulfur Plant (Plant 10). Cryogenic Hydrogen Purification (Plant 8) purifies the purge gas stream from the Gas Plant (Plant 7, described in Report IV, Volume 4) to a 93% purity hydrogen product. Sour Water Treating (Plant 9) removes free ammonia and acid gases from sour water and separates them to recover a high quality anhydrous ammonia product. The Sulfur Plant (Plant 10) recovers, as a saleable liquid product, approximately 95% of the sulfur in feed streams from the Gas Plant (Plant 7, described in Report IV, Volume 4), Sour Water Treating (Plant 9), Gasification and Purification (Plant 12, described in Report IV, Volume 6), and Stack Gas Scrubbing (Plant 35, described in Report V, Volume 3). The following information is included for each of the three plants described in this volume: a description of the plant's process design, including the utility balance, catalysts and chemicals usage, and a process flow diagram; an equipment list, including item numbers and descriptions; data sheets and sketches for major plant components; and pertinent engineering drawings. An appendix contains: an overall site plan showing the locations of all plants; and the symbols and legend for the piping and instrument diagrams included in this volume.

62601 **(DOE/OR/20717—4-Vol.6) Breckinridge Project, initial effort.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 229p. NTIS, PC A11/MF A01. Order Number DE83000190.

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Report IV, Volume 6 provides descriptions, data, and drawings pertaining to Gasification and Purification (Plant 12). Gasification and Purification (Plant 12) produces makeup hydrogen for H-COAL Preheating and Reaction (Plant 3), and produces a medium Btu fuel gas for consumption in fired heaters. The following information is included: a description of the plant's process design, including the utility balance, catalysts and chemicals usage, and a process flow diagram; an equipment list, including item numbers and descriptions; data sheets and sketches for major plant components; and pertinent engineering drawings. An appendix contains: an overall site plan showing the locations of all plants; and the symbols and legend for the piping and instrument diagrams included in this volume. Gasification and Purification (Plant 12) utilizes process technology from three licensors: gasification of vacuum bottoms using the Texaco process, shift conversion using the Haldor Topsoe process, and purification of fuel gas and shifted gas using the Allied

Chemical Selexol process. This licensed technology is proprietary in nature. As a result, this volume does not contain full disclosure of these processes although a maximum of information has been presented consistent with the confidentiality requirements. Where data appears incomplete in this volume, it is due to the above described limitations. Full data concerning this plant are available for DOE review at the Houston offices of Bechtel Petroleum, Inc.

62602 (DOE/OR/20717—4-Vol.7) Breckinridge Project, initial effort. (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 260p. NTIS, PC A12/MF A01. Order Number DE83000187.

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Report IV, Volume 7 provides descriptions, data, and drawings pertaining to the Oxygen Plant (Plant 15) and Naphtha Hydrotreating and Reforming (Plant 18). The Oxygen Plant (Plant 15) utilizes low-pressure air separation to manufacture the oxygen required in Gasification and Purification (Plant 12). The Oxygen Plant also supplies nitrogen as needed by the H-COAL process. Naphtha Hydrotreating and Reforming (Plant 18) upgrades the raw H-COAL naphtha. The following information is provided for both plants described in this volume: a description of the plant's process design, including the utility balance, catalysts and chemicals usage, and process flow diagrams; an equipment list including item numbers and descriptions; data sheets and sketches for major plant components (Oxygen Plant only); and pertinent engineering drawings. An appendix contains: an overall site plan showing the locations of all plants; and the symbols and legend for the piping and instrument diagrams included in this volume.

62603 (DOE/OR/20717—5-Vol.1) Breckinridge Project, initial effort. (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 285p. NTIS, PC A13/MF A01. Order Number DE83000182.

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Report V, Volume 1 provides descriptions, data, and drawings pertaining to Flare System (Plant 19), Tankage (Plant 20), Interconnecting Piping (Plant 21), River Facilities (Plant 22), Rail, Truck, Pipeline (Plant 23), and Electrical Distribution (Plant 30). Flare System (Plant 19) provides primary and auxiliary flare systems for safe collection and disposal of overpressure relief discharges, and operational and emergency venting of flammable vapors and liquids from the various processing plants and loading facilities. Tankage (Plant 20) provides storage for propane and heavier liquid hydrocarbon products, as well as for by-product ammonia, phenols, and liquid sulfur. Interconnecting Piping (Plant 21) includes the fuel gas blending and distribution system and the interconnecting process and utility piping between process plants and offsites. River Facilities (Plant 22) provides the loading of liquid products and by-products into barges for marine surface transportation, and the unloading of coal from barges. Rail, Truck, Pipeline (Plant 23) provides loading and unloading of products shipped by either rail or truck. Electrical Distribution (Plant 30) receives main utility power from the Big River Electric Corporation and distributes the power to the other plants. The following information is included for each of the six plants: a description of the plant's design, including the utility balance, catalysts and chemicals usage, and process flow diagrams, as applicable; an equipment list, including item numbers and descriptions; data sheets and sketches for major plant components; and pertinent engineering drawings. An appendix contains: an overall site plan showing the locations of all plants; and the symbols and legend for piping and instrument diagrams.

62604 (DOE/OR/20717—5-Vol.2) Breckinridge Project, initial effort. (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 462p. NTIS, PC A20/MF A01. Order Number DE83000183.

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The project cogeneration plant supplies electric power, process steam and treated boiler feedwater for use by the project plants. The plant consists of multiple turbine generators and steam generators connected to a common main steam header. The major plant systems which are required to produce steam, electrical power and treated feedwater are discussed individually. The systems are: steam, steam generator, steam generator fuel, condensate and feedwater deaeration, condensate and blowdown collection, cooling water, boiler feedwater treatment, coal handling, ash handling (fly ash and bottom ash), electrical, and control system. The plant description is based on the Phase Zero design basis established for Plant 31 in July of 1980 and the steam/condensate balance as presented on Drawing 31-E-B-1. Updating of steam requirements as more refined process information becomes available has generated some changes in the steam balance. Boiler operation with these updated requirements is reflected on Drawing 31-D-B-1A. The major impact of updating has been that less 600 psig steam generated within the process units requires more extraction steam from the turbine generators to close the 600 psig steam balance. Since the 900 psig steam generation from the boilers was fixed at 1,200,000 lb/hr, the additional extraction steam required to close the 600 psig steam balance decreased the quantity of electrical power available from the turbine generators. In the next phase of engineering work, the production of 600 psig steam will be augmented by increasing convection bank steam generation in the Plant 3 fired heaters by 140,000 to 150,000 lb/hr. This modification will allow full rated power generation from the turbine generators.

62605 (DOE/OR/20717—5-Vol.3) Breckinridge Project, initial effort. (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 398p. NTIS, PC A17/MF A01. Order Number DE83000198.

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Report V, Volume 3 provides descriptions, data, and drawings pertaining to Stack Gas Scrubbing (Plant 35). Stack Gas Scrubbing processes tail gas from the Sulfur Plant (Plant 10, described in Report IV, Volume 5) and flue gas from Steam Generation and Boiler Feedwater Treating (Plant 31, described in Report V, Volume 2) to remove sulfur dioxide from the gas. The following information is included for the plant described in this volume: a description of the plant's design, including the utility balance, catalysts and chemicals usage, and a process flow diagram; an equipment list, including item numbers and descriptions; data sheets and sketches for major plant components; and pertinent engineering drawings. An appendix contains: an overall site plan showing the locations of all plants; and the symbols and legend for the piping and instrument diagrams included in this volume.

62606 (DOE/OR/20717—5-Vol.4) Breckinridge Project, initial effort. (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 234p. NTIS, PC A11/MF A01. Order Number DE83000174.

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Report V, Volume 4 provides descriptions, data, and drawings pertaining to Instrument and Plant Air Systems (Plant 36), Telecommunication Systems (Plant 37), Inert Gas Systems (Plant 38), Purge and Flush Oil Systems (Plant 39), Site Development and Roads (Plant 40), Buildings (Plant 41), Solid Waste Management (Plant 42), and Landfill (Plant 44). Instrument and Plant Air Systems (Plant 36) includes all equipment and piping necessary to supply instrument and utility air to the process plants and offsite facilities. Telecommunication Systems (Plant 37) includes the equipment and wiring for: communication throughout the facility; communication between plant data processing systems and offsite computing facilities; and communication with transportation carriers. Inert Gas Systems (Plant 38) provides high purity and low purity nitrogen streams for plant startup and normal operation. Purge and Flush Oil Systems (Plant 39) provides purge and flush oils to various plants. Site Development and Roads (Plant 40) provides site leveling, the addition of roads, fencing, and drainage, and the placement of fills, pilings, footings, and foundations for plants. Buildings (Plant 41) provides buildings for equipment and for personnel, including utilities, lighting, sanitary facilities, heating, air conditioning, and ventilation. Solid Waste Management (Plant 42) identifies, characterizes, segregates, and transports the various types of solid wastes to either Landfill (Plant 44) or outside disposal sites. Landfill (Plant 44) provides disposal of both nonhazardous and hazardous solid wastes. Information is included (as applicable) for each of the eight plants described.

62607 **(DOE/OR/20717—6) Breckinridge Project, initial effort. Report VI. Project Management Plan.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 214p. NTIS, PC A10/MF A01. Order Number DE83000175.

Report VI presents a comprehensive plan for the management of the Breckinridge Project. For the purpose of this report, the project work is divided into five major project phases: Development, Engineering, Procurement, Construction, and Operations. The results of the Development Phase (Initial Effort) of the project are discussed in Section 1.0. This phase of the project was performed under a Cooperative Agreement with US Department of Energy and has produced 43 volumes of documentation. Fifteen volumes contain information of proprietary nature for patented processes and are therefore classified as Limited Access; however, twenty-eight volumes are not classified and are suitable for public dissemination. This Project Management Plan is a volume of the unclassified documentation. The other twenty-seven volumes contain comprehensive data on technical, financial, and environmental aspects of the project. Each of the four remaining project phases is presented starting with the extensive planning that will be performed and continuing through to the execution and completion of each phase. The major roles of the Operator, Ashland Synthetic Fuels, Inc. (ASFI), and the Managing Contractor are defined. Although a contract has not yet been executed with a Managing Contractor, the procedures, controls, organization and management philosophy of Bechtel Petroleum, Inc., are presented in this report as being representative of those used by contractors in the business of performing the engineering, procurement, and construction of projects of this size and complexity. The organizational structures of the Operator and the Managing Contractor are described, with designation of key project team personnel by job description and organization charts. Provisions for cost, schedule, and material control are described.

62608 **(DOE/OR/20717—7-Vol.1) Breckinridge Project, initial effort. Report VII, Volume I. Introduction and background.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 222p. NTIS, PC A10/MF A01. Order Number DE83000169.

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The proposed plant site consists of 1594 acres along the Ohio River in Breckinridge County, Kentucky. An option to purchase the site has been secured on behalf of the Breckinridge Project by the Commonwealth of Kentucky Department of Energy. Figure 1 is an area map locating the site with respect to area cities and towns. The nearest communities to the site are the hamlet of Stephensport, Kentucky, about 3-1/2 miles northeast and Cloverport, Kentucky, which is 6 miles to the southwest. The nearest major cities are Owensboro, Kentucky, 45 road miles to the west and Louisville, Kentucky, 65 miles to the northeast. The Breckinridge facility will convert about 23,000 TPD of run-of-mine (ROM) coal into a nominal 50,000 BPD of hydrocarbon liquids including a significant quantity of transportation fuels. Major products refined for marketing include pipeline gas, propane, butane, 105 RONC gasoline reformate, middle distillate and heavy distillate. By-products include sulfur, anhydrous ammonia, and commercial-grade phenol. Care is being taken to minimize the impact of the facility operations on the environment. Water and wastewater treatment systems have been designed to achieve zero discharge. Waste solids will be disposed of in a carefully designed and well-monitored landfill operation. Also, special design features have been included to minimize air emissions.

62609 **(DOE/OR/20717—7-Vol.2) Breckinridge Project, initial effort. Report VII, Volume II. Environmental baseline report.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 603p. NTIS, PC A99/MF A01. Order Number DE83000172.

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Ashland Synthetic Fuels, Inc. (ASFI) and Airco Energy Company, Inc. (AECI) have recently formed the Breckinridge Project and are currently conducting a process and economic feasibility study of a commercial scale facility to produce synthetic liquid fuels from coal. The coal conversion process to be used is the H-COAL process, which is in the pilot plant testing stage under the auspices of the US Department of Energy at the H-COAL Pilot Plant Project near Catlettsburg, Kentucky. The preliminary plans for the commercial plant are for a 18,140 metric ton/day (24,000 ton/day) nominal coal assumption capacity utilizing the abundant high sulfur Western Kentucky coals. The Western Kentucky area offers a source of the coal along with adequate water, power, labor, transportation and other factors critical to the successful siting of a plant. Various studies by federal and state governments, as well as private industry, have reached similar conclusions regarding the suitability of such plant sites in western Kentucky. Of the many individual sites evaluated, a site in Breckinridge County, Kentucky, approximately 4 kilometers (2.5 miles) west of the town of Stephensport, has been identified as the plant location. Actions have been taken to obtain options to insure that this site will be available when needed. This report contains an overview of the regional setting and results of the baseline environmental studies. These studies include collection of data on ambient air and water quality, sound, aquatic and terrestrial biology and geology. This report contains the following chapters; introduction, review of significant findings, ambient air quality monitoring, sound, aquatic ecology, vegetation, wildlife, geology, soils, surface water, and ground water.

62610 **(DOE/OR/20717—7-Vol.3) Breckinridge Project, initial effort. Report VII, Volume III. Cultural resource assessment socioeconomic background data.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 299p. NTIS, PC A13/MF A01. Order Number DE83000179.

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This report has been prepared in conjunction with an environmental baseline study for a commercial coal conversion facility being conducted by Ashland Synthetic Fuels, Inc. (ASFI) and Airco Energy Company (AECO). This report represents a cultural resource assessment for the proposed plant site and two potential solid waste disposal areas. This assessment presents data collected by Dames and Moore during a recent archaeological reconnaissance of the unsurveyed southeastern portion of the proposed plant site and two potential solid waste disposal areas. Also, results of two previous surveys on the northern and southwestern portion of the plant site for American Smelting and Refining Company (ASARCO) and Kentucky Utilities are included. The Dames and Moore survey of the southeastern portion of the plant site identified one archaeological site, three standing structures and one historic cemetery. In addition 47 archaeological sites and six standing structures are known from two previous surveys of the remainder of the plant site (Cowan 1975 and Turnbow et al 1980). Eleven of the previously recorded archaeological sites were recommended for further assessment to evaluate their potential for inclusion within the Holt Bottoms Archaeological District currently listed on the National Register of Historic Places. None of the archaeological sites or standing structures located within the plant site during the Dames and Moore survey were recommended for further assessment. A total of eight archaeological sites were located during the Dames and Moore survey of the two potential solid waste disposal areas. Of this total only two sites were recommended for further assessment. Also, one previously unknown historic cemetry was located in the southernmost potential waste disposal area.

62611 **(DOE/OR/20717—7-Vol.4) Breckinridge Project, initial effort. Report VII, Volume 4. Safety and health plan.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 307p. NTIS, PC A14/MF A01. Order Number DE83000178.

The Safety and Health Plan recognizes the potential hazards associated with the Project and has been developed specifically to respond to these risks in a positive manner. Prevention, the primary objective of the Plan, starts with building safety controls into the process design and continues through engineering, construction, start-up, and operation of the Project facilities and equipment. Compliance with applicable federal, state, and local health and safety laws, regulations, and codes throughout all Project phases is required and assured. The Plan requires that each major Project phase be thoroughly reviewed and analyzed to determine that those provisions required to assure the safety and health of all employees

and the public, and to prevent property and equipment losses, have been provided. The Plan requires followup on those items or situations where corrective action needs were identified to assure that the action was taken and is effective. Emphasis is placed on loss prevention. Exhibit 1 provides a breakdown of Ashland Synthetic Fuels, Inc.'s (ASFI's) Loss Prevention Program. The Plan recognizes that the varied nature of the work is such as to require the services of skilled, trained, and responsible personnel who are aware of the hazards and know that the work can be done safely, if done correctly. Good operating practice is likewise safe operating practice. Training is provided to familiarize personnel with good operational practice, the general sequence of activities, reporting requirements, and above all, the concept that each step in the operating procedures must be successfully concluded before the following step can be safely initiated. The Plan provides for periodic review and evaluation of all safety and loss prevention activities at the plant and departmental levels.

62612 **(DOE/OR/20717—8) Breckinridge Project, initial effort. Report VIII. Capital cost estimate.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 205p. NTIS, PC A10/MF A01. Order Number DE83000173.

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The major objective of the Initial Effort for the Breckinridge Project is to develop engineering to the point where realistic economics for the construction and operation of the plant can be made. The plant is designed to process 23,000 tons per day of run-of-mine coal to produce a nominal 50,000 barrels per day of liquid products using the H-COAL and standard industry technology. The plant will be located in Breckinridge County, Kentucky. Considerable preliminary engineering has been performed for this estimate. This work uses a single-point design based on the Process Demonstration Unit (PDU) data from run 5, period 29 of the pilot plant. The design basis is discussed in Volume II of this report. Many aspects of plant construction and cost have been considered that were not taken into account in the past studies. Ashland and Bechtel believe the accuracy of the capital estimate to be +19%, -17%. This accuracy is postulated on January 1981 dollars, the as-spent dollar amount naturally depending upon the inflation rate through the construction period. Considerable attention has been devoted to reliability of operation, and redundant equipment has been used where it was deemed necessary to assure reasonable on-stream time. This equipment is included in the capital estimate. The capital is summarized by total plant cost on Table 1. The subtotal plant cost, excluding contingency, fee, and adjustment is $2,710,940,000. Adding the contingency, fee and adjustment, the total depreciable cost of the plant is $3,167,430,000. Adding the working capital to the total plant cost results in total capital requirements of $3,258,430,000 as shown on the individual plant cost summary Table 2.

62613 **(DOE/OR/20717—9) Breckinridge Project, initial effort. Report IX. Operating cost estimate.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 202p. NTIS, PC A13/MF A01. Order Number DE83000170.

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Operating costs are normally broken into three major categories: variable costs including raw materials, annual catalyst and chemicals, and utilities; semi-variable costs including labor and labor related cost; and fixed or capital related charges. The raw materials and utilities costs are proportional to production; however, a small component of utilities cost is independent of production. The catalyst and chemicals costs are also normally proportional to production. Semi-variable costs include direct labor, maintenance labor, labor supervision, contract maintenance, maintenance materials, payroll overheads, operation supplies, and general overhead and administration. Fixed costs include local taxes, insurance and the time value of the capital investment. The latter charge often includes the investor's anticipated return on investment. In determining operating costs for financial analysis, return on investment (ROI) and depreciation are not treated as cash operating costs. These costs are developed in the financial analysis; the annual operating cost determined here omits ROI and depreciation. Project Annual Operating Costs are summarized in Table 1. Detailed supporting information for the cost elements listed below is included in the following sections: Electrical, catalyst and chemicals, and salaries and wages.

62614 **(DOE/OR/20717—10) Breckinridge Project, initial effort. Report X. Economic analysis and financial plan.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 248p. NTIS, PC A11/MF A01. Order Number DE83000180.

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The economic evaluation presented in this volume is based upon the cost estimates developed in the Phase Zero effort and an evaluation of product market values developed by the PACE Company Engineers and Consultants, Inc. All costs and revenues have been adjusted to reflect the impact of inflation, consistent with the forecast shown in Table 2.1, Page 2-19. Tax treatment reflects expert interpretation of the tax law in effect January 1981. The Marketing Analysis section is an abstract of a detailed report prepared by the PACE Company for the Breckinridge Project. It provides the reader with an understanding of the methodology used to establish product values, and identifies and interprets the effects of key variables that impact market prices. The base case economic scenario, considered the most likely to occur, anticipates that the world economic growth, as well as that of the United States, will be substantially less than that experienced during the previous twenty years. Under the scenario, major disruptions in crude oil supply will not occur. Therefore, prices in real terms at the end of this century are projected to be slightly higher than the peak price of 1981. Domestic natural gas supplies are expected to expand as a result of deregulation and increased importation of LNG. Two alternate economic scenarios are also considered. Sensitivity analysis of both alternate economic scenarios and key project variables clearly point to the market price of crude oil as the dominant economic factor determining this project's soundness. The base case forecast is considered to be not only the most likely case but one not likely to be proven optimistic. The Financial Plan section outlines provisions and presents a plan for financial management of the project.

62615 **(DOE/OR/20717—11-Vol.1) Breckinridge Project, initial effort. Report XI, Volume I. Engineering comparisons.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 227p. NTIS, PC A11/MF A01. Order Number DE83000194.

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The objective of this study is to define the number of trains, capacity of each train, and logical places for manifolding and intermediate storage so as to insure a reasonable expectancy of achieving commercially acceptable goals for reliability and availability at the lowest capital per annual barrel of capacity. The objective of the next phase of this study will be to define in greater detail the capacity arrangement and sparing of components within each process area. This will further define the basis for expected production to be used in the financial analysis. Reliability-Availability data for critical equipment components in coal-liquefaction areas (200, 300, 400, 500) and residue gasification area (1200, 1300) were developed by a consensus of extrapolation of past experience of ASFI, Bill David and EA. Data for other areas, which are duplicates of current practice, were based on industry experience. These data were treated by mathematical probabilistic methods to derive an assessment of individual area availabilities and of total system availabilities. The base system was modified as to number of operating lines, degree of input/output manifolding, use of storage, and amount of surplus (redundant) capacity. These modifications defined alternate systems which were evaluated from the standpoint of system availability and cost impact. A system which gave the lowest product costs was defined and recommended as the design basis for Phase 0 development. This system appears to: Achieve desired availability goals, results in the lowest capital per annual barrel, and use currently available technology for fabrication and/or scale-up of the key process units.

62616 **(DOE/OR/20717—11-Vol.2) Breckinridge Project, initial effort. Report XI, Volume II. Engineering comparisons.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 290p. NTIS, PC A13/MF A01. Order Number DE83000196.

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Volume 2 consists of engineering justifications, engineering and economic comparisons of other engineering solutions and detailed engineering studies (mainly related to hydrogen production, purification, recycling, etc). (LTN)

62617 **(DOE/OR/20717—11-Vol.3) Breckinridge Project, initial effort. Report XI, Volume III. Critical design areas.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 62p. NTIS, PC A04/MF A01. Order Number DE83000186.

Several meetings have been held with representatives from Ashland Synthetic Fuels, Inc.; Airco Energy Company, Inc.; Bechtel Group, Inc.; and HRI Engineering, Inc. to identify critical design areas in the Phase Zero work. (Critical design areas are defined as those requiring additional data or further work to finalize design or material selection, to optimize the trade-off between capital investment and operating cost, or to enhance system operability and reliability.) The critical design areas so identified are summarized by plant in this volume of Report XI. Items of a proprietary nature have been omitted from this report, but are included in the limited access version.

62618 **(DOE/OR/20717—11-Vol.4) Breckinridge Project, initial effort. Report XI, Volume IV. Critical review of the design basis.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 441p. NTIS, PC A19/MF A01. Order Number DE83000181.

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Report XI, Technical Audit, is a compendium of research material used during the Initial Effort in making engineering comparisons and decisions. Volumes 4 and 5 of Report XI present those studies which provide a Critical Review of the Design Basis. The Critical Review Report, prepared by Intercontinental Econergy Associates, Inc., summarizes findings from an extensive review of the data base for the H-Coal process design. Volume 4 presents this review and assessment, and includes supporting material; specifically, Design Data Tabulation (Appendix A), Process Flow Sheets (Appendix B), and References (Appendix C). Volume 5 is a continuation of the references of Appendix C. Studies of a proprietary nature are noted and referenced, but are not included in these volumes. They are included in the Limited Access versions of these reports and may be reviewed by properly cleared personnel in the offices of Ashland Synthetic Fuels, Inc.

62619 **(DOE/OR/20717—11-Vol.5) Breckinridge Project, initial effort. Report XI, Volume V. Critical review of the design basis.** (Ashland Synthetic Fuels, Inc., KY (USA); Airco Energy Co., Inc., Ashland, KY (USA)). [nd]. Contract FC05-80OR20717. 559p. NTIS, PC A24/MF A01. Order Number DE83000168.

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Report XI, Technical Audit, is a compendium of research material used during the Initial Effort in making engineering comparisons and decisions. Volumes 4 and 5 of Report XI present those studies which provide a Critical Review of the Design Basis. The Critical Review Report, prepared by Intercontinental Econergy Associates, Inc., summarizes findings from an extensive review of the data base for the H-Coal process design. Volume 4 presents this review and assessment, and includes supporting material; specifically, Design Data Tabulation (Appendix A), Process Flow Sheets (Appendix B), and References (Appendix C). Volume 5 is a continuation of the references of Appendix C. Studies of a proprietary nature are noted and referenced, but are not included in these volumes. They are included in the Limited Access versions of these reports and may be reviewed by properly cleared personnel in the offices of Ashland Synthetic Fuels, Inc.

0105 By-products

REFER ALSO TO CITATION(S) 62588

62620 **(NE/TORV—81/5) Vyrmetan - High stage, progress report.** Martinell, R. (Naemnden foer Energiproduktionsforskning, Stockholm (Sweden)). 1981. 85p. (In Swedish). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82750051.

Earlier tests and studies have shows that present energy sourpeat. Des can be increased through the production of methane gas from peats. During stage 4 a new plant was built in test area 2. On basis of the experiences from stage 3, three draining pipes of 50 m length were each laid parallel to each other in the peat at about 2 meters depth. The two outer drains are used for the pumping of peat water. The inner drain is used for the back infiltration of the degassed peat water. Considerable movements and yielding in the peat were caused by the excavator. The three drains had therefore to be placed at a distance of 15 meter from each other, which resulted in an unsufficient flow . Rain and snow cause a considerable flow of surface water to the yieldings left after the excavation. The average methane content during this stage 20 mg/l water. Under extremely good conditions the methane content has been 25 up to 28 mg/l water, A trial has been made to halve the distance between the infiltration and the extraction drains. 10 wells were pressed down half-way between the drains. The infiltration water to the peat has been pumped to these wells. The point load led to leakage of infiltration water outside the well pipe. Two drains will be placed instead of the two wells and in the same place where the wells now are installed. In test area 2 a temperature and redox meter has been installed for continous measuring. Furthermore, sampling tubes have been put down in the peat for determination of the pH, methane content and carbon dioxide. The number of tubes has been gradually increased and is now comprising 9 groups of 7 tubes each. The methane content, carbon dioxide and fatty acids are measured by gas chromatography.

0106 Properties

REFER ALSO TO CITATION(S) 62575, 62582, 62585, 62674, 63280, 63281

62621 **(BMFT-FB-T—82-055) Caking and coking power of bituminous coals under high pressures.** Beyer, H.D. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Apr 1982. 62p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750628.

The caking and coking power of bituminous coals characterized by the swelling index (DIN 51 741, ISO 501) and the dilatometer test (DIN 51 739) respectively has not been studied at high pressures until now. In the context of the further development of coal gasification processes, pressures up to 100 bar are being discussed. The aim of this research project is to clarify the influence of the pressure on swelling index and dilatation. Pressure devices have been developed in which swelling index and dilatation can be measured at pressures up to 100 bar under the geometric and thermal conditions required for standard methods, too. Pressure, heating rate, coal grain size and gas atmosphere (Ar and H_2) were varied apart from the coal type in the course of the measurements. The measurements show swelling index and dilatation may decrease, may sometimes increase or increase first followed by a decrease at higher pressures. Therefore, it is in general not possible to establish relationship according to which the data characterizing caking and coking power could be calculated on the basis of the data obtained under standard conditions. For this reason, the prediction of caking and coking power of feedcoals in coal refining processes working under pressure requires measurements conducted under the envisaged operating pressure. The developed pressure devices are suited for this purpose and can be used on a routine basis.

62622 **(DOE/ET/10112—T1) Analytical studies for the H-Coal process. Final report.** Becker, M.; Bendoraitis, J.G.; Bloch, M.G.; Cabal, A.V.; Callen, R.B.; Green, L.A.; Hills, F.J.; Simpson, C.A.; Trewella, J.C. (Mobil Research and Development Corp., Paulsboro, NJ (USA)). Jul 1982. Contract AC05-77ET10112. 121p. (FE—2676-8). NTIS, PC A06/MF A01. Order Number DE82019835.

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H-Coal Syncrude product streams, prepared from Illinois No. 6, Wyodak, or West Kentucky No. 11 coal were obtained from the H-Coal Process Development Unit (PDU) and analyzed for physical properties, elemental compositions, trace metal levels, and molecular composition. The trace metal levels are generally low in all except the heavy fuel oils. Although the product streams bear some similarity to comparable petroleum streams, they differ in that, for example, the H-Coal non-aromatic cuts are more naphthenic, and the aromatic cuts account for a higher proportion of the streams. The naphthas contain predominently cyclic compounds which upon catalytic reforming should yield high octane gasoline. However, coal liquids contain significant amounts of highly polar compounds. In the naphthas these compounds are mainly phenols, anilines, and pyridines, which would need to be removed prior to use as gasoline. After storage for one year solids formed in all products, generally increasing with time and temperature. Naphtha gum levels also increased. Most of the other changes were relatively minor. The overflow from the Lummus 10" gravity settler deashing unit contained significantly less ash, sulfur, and oxygen and more hydrogen and nitrogen than the hydroclone underflow charged. Product acceptability tests were performed on H-Coal boiler fuel produced when the unit was operated in the boiler fuel mode. Although the fuel was low in sulfur, nickel, and vanadium, it had high viscosity pour point, and sediment values, and was incompatible with conventional heating oil.

62623 **(DOE/FC/RI—82/4) 200-MHz ^{1}H NMR spectral catalog of standards related to low-rank coal-derived materials.** Farnum, S.A.; Potts, Y.R.; Farnum, B.W. (USDOE Grand Forks Energy Technology Center, ND). Sep 1982. 391p. NTIS, PC A17/MF A01. Order Number DE83000087.

Portions of document are illegible.

At the Grand Forks Energy Technology Center (GFETC) 200 MHz ^{1}H NMR is used extensively to identify the components in complex low-rank coal-derived materials. When high-resolution ^{1}H NMR is used with complementary techniques such as capillary gas chromatography (GC), ^{13}C NMR spectroscopy and capillary GC-mass spectrometry, the full power of the method is realized. There are many advantages in carrying out these studies with stable, high-field instruments such as the 47 kGauss superconducting solenoid system used here. The larger chemical shift separations and the simplified spectra obtained are easy to interpret. The signal to noise is large when small samples are used thus enabling efficient operation with sparsely soluble material or with very small samples. We have found a collection of 200 MHz ^{1}H NMR spectra of standards to be essential in this type of study. When experimental conditions are identical, chemical shift values of the material in the coal-derived sample will agree with the shift values of the standards within +-0.05 ppM. Since no spectral collection of this type is currently available, we have prepared a library of standards used at GFETC. Since the ^{1}H spectra at 200 MHz are different due to high field strength leading to more first order spectra, standard 60 MHz spectral catalogs are of limited use. The materials included in this collection are all related to low-rank coal samples.

62624 **Diterpenoid acids in Yallourn lignite.** Shaw, G.J. (Univ. of Bristol, England); Franich, R.A.; Eglinton, G.; Allan, J.; Douglas, A.G. *Physics and Chemistry of the Earth;* **12**: 281-286(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

Yallourn lignite, a resin-rich, brown coal of coniferous origin from Victoria, Australia, together with its component maceral, resinite, has been extracted and the free carboxylic acid fractions analyzed by GC-MS. The fate of the unsaturated diterpenoid components, especially those of the pimarane skeletal type, appears to encompass, besides preservation, hydrogenation, aromatization, dealkylation and other diagenetic processes.

62625 **Analysis of coals of different rank by Curie-point pyrolysis-mass spectrometry and Curie-point pyrolysis-gas chromatography-mass spectrometry.** van Graas, G.; de Leeuw, J.W.; Schenck, P.A. (Delft Univ. of Tech., Netherlands). *Physics and Chemistry of the Earth;* **12**: 485-494(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

A series of humic coals of different rank (fixed carbon contents 55 to 94%) have been investigated by Curie-point pyrolysis-low-voltage mass spectrometry and Curie-point pyrolysis-gas chromatography-mass spectrometry. The pyrolysis-mass spectra have been compared using factor anlaysis (principal components analysis). This leads to the conclusion that a limited number of masses are correlated almost exclusively with coal rank. Others are related to the differing maceral compositions of the coals. The GC-MS data show that the masses related to the coalification can be ascribed to indanes, indenes, benzofurans and phenolic compounds.

62626 **Hydrogen and carbon isotopic composition of coals and kerogens.** Redding, C.E. (Bundesanstalt fuer Geowissenschaften und Rohstoffe, Hannover, Germany); Schoell, M.; Monin, J.C.; Durand, B. *Physics and Chemistry of the Earth;* **12**: 711-723(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

Hydrogen and carbon bearing constituents depleted in ^{13}C and D with respect to their parent material are released during coalification. The residue should therefore be continuously enriched in both isotopes with increasing maturity. Published pyrolysis experiments have shown methane to be the only compound evolved in significant quantities during heating that also fractionates to a large degree in carbon and hydrogen. Theoretical considerations predict fractionations of more than 5 0/00 in δ^{13}C and ~ 200 0/00 in δD for high maturity coals and kerogens. Our investigations of type kerogens have shown minimal carbon isotope fractionation and 10 to 25 0/00 fractionation in δD. We have thus concluded that at most only ~ 10% of the hydrogen reservoir could have been converted to methane in a direct single-step reaction. Investigations of a contact metamorphosed Tertiary lignite have yielded similar results. This confirms the trend found in the type kerogens. Large hydrogen isotopic variations were found in coals occurring worldwide (-170 to -90 0/00). These must be interpreted as primary, source controlled variations; as (i) there is no correlation between maturity and δD values, and (ii) the Gondwana coals (-170 < δD < -135) are distinctly different from the American and European coals (-140 < δD < -90). We conclude that methane can only be formed in a single-step reaction from kerogen in significant quantities during late stage metagenesis and metamorphism and that the major portion of hydrocarbons released during catagenesis and early metagenesis is released as a liquid phase from which methane is cracked.

0108 Waste Management

REFER ALSO TO CITATION(S) 62994, 62996, 63357

62627 **(EPRI-CS—2525) Full-scale scrubber characterization of Conesville Unit 5. Final report.** Smith, E.O.; Morgan, W.E.; Ferguson, A.W.; Galeski, J.B. (Black and Veatch Consulting Engineers, Kansas City, MO (USA)). Aug 1982. 889p. NTIS, PC A99/MF A01. Order Number DE82906488.

Portions of document are illegible.

The flue gas desulfurization system at Columbus and Southern Ohio Electric Company Conesville Unit 5 was characterized by field testing and engineering analysis. The characterization included measurement of currently regulated as well as unregulated emissions in the gas, liquid, and solid effluent streams of the sulfur dioxide scrubber system. Sulfur dioxide, nitrogen oxides, particulate, fine particulate, trace elements, particle size-segregated trace element distribution, sulfuric acid mist, chlorides, fluorides, organics, carbon monoxide, and carbon dioxide were all measured in the scrubber system influent and effluent streams. In addition, mist eliminator performance, scrubber generated particulate, and scrub-

ber sludge characterization testing and analyses were performed. A discussion of the scrubber process chemistry based on the system performance data gathered is presented. An engineering and economic analysis of the scrubber system, including suggested improvements to the system, is included. Sulfur dioxide removal efficiencies from 94 to over 99% were found over a range of boiler loads and scrubber liquid-to-gas ratios for the Conesville Unit 5 magnesium-enhanced lime scrubbing system. Particulate levels were essentially the same at the inlet and outlet of the scrubber system. The capital cost of the scrubber system, additive preparation system and sludge disposal system was about $62.78/kW. The annual operating cost was 5.5 mills/kWh for 1979 based on a 48% capacity factor. Major operational problem areas have included the slurry preparation system, scrubber vessel lining, and the thickener. The scrubber system availability has improved to a level of about 70% for recent operational periods as contrasted to an availability of about 40% for the first few years of scrubber operation.

62628 **Dioxins not detected in effluents from coal/refuse combustion.** Junk, G.A.; Richard, J.J. (Iowa State Univ., Ames, IA). *Chemosphere;* **10**: No. 11-12, 1237-1241(1981).

No 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin was detected in effluents from a powerplant burning coal supplemented with processed municipal wastes. These negative findings, in contrast with the many reports of the presence of dioxins from waste incineration, are proposed to be due to the high temperature of ~1200°C for the combustion of small pieces of refuse with adequate oxygen for times sufficient to insure complete oxidation.

0109 Environmental Aspects

REFER ALSO TO CITATION(S) 62581, 62589, 62609, 62647, 63515

62629 **(CONF-8108134—1) Modeling the potential public-health impacts of airborne releases.** Meyer, H.R.; Holton, G.A. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 12p. NTIS, PC A02/MF A01. Order Number DE82020833.

From Workshop on potential public health impacts of organic matter released to the air upon combustion; Upton, NY, USA (17 Aug 1981).

The methodology used for risk assessment of coal gasification industry is presented. Specific areas addressed are: release rates for compounds of biological significance, uptake and transport of these materials through the environment, and the biological impacts. (PSB)

62630 **(ECN—120) Leaching of trace elements from coal solid waste.** Van Der Sloot, H.A.; Wijkstra, J.; Van Dalen, A.; Das, H.A.; Slanina, J.; Dekkers, J.J.; Wals, G.D. (Netherlands Energy Research Foundation, Petten). Aug 1982. 200p. NTIS (US Sales Only), PC A09/MF A01. Order Number DE82906047.

Portions of document are illegible.

In the present work leaching of ash from coal-fired power plants is described. It concerns precipitator ash from powder-coal fired utilities, desulfurization ash from a dry-scrubbing process and fabric filter ash from a fluidized-bed boiler. Reproducibility of shake tests and column leaching has been studied. In the shake tests a wide range of solid to liquid ratios is applied, which allows extrapolation to column conditions. Column experiments carried out in upflow at a fixed flow-rate of ~ 1 cm per day showed good column performance and proved that equilibrium is reached fairly rapidly. A classification of precipitator ashes with respect to leaching behavior is given, which allows an estimate of leaching characteristics beforehand. In relation to this, the variability in coal and ash compositions has been studied. If we assume that, except for the extremely volatile (e.g. Hg, Br, Cl, F, B, (Se)), all elements including the chalacophile group elements are nearly completely retained in/on the ash collected by electrostatic precipitators, it should then be possible to relate coal composition for these elements to ash composition by means of the ash content of the coal. This assumption was verified; over the entire concentration range the agreement between predicted and measured ash composition is good. For most elements the deviation falls well within the uncertainty quoted. A large discrepancy is noted for Cr.

62631 **(PB—81-220048) Control techniques for sulfur oxide emissions from stationary sources, second edition.** (Environmental Protection Agency, Research Triangle Park, NC (USA)). Apr 1981. 560p. NTIS, PC A24/MF A01.

Available data on characterization and sampling methods for sulfur oxides, descriptions of stationary sources of sulfur oxides and control techniques used to reduce sulfur oxide emissions are presented. Control costs and energy and environmental impact of controlling sulfur oxide emissions are also discussed.

62632 **Application of long-range transport modeling to assess coal development.** Sandusky, W.F.; Renne, D.S. (Battelle Pacific Northwest Laboratories, Richland, Wash.). pp 555-560 of Symposium on Turbulence, Diffusion, and Air Pollution, 4th, Reno, Nev., January 15-18, 1979. Boston, MA; American Meteorological Society (1978).

From 4. symposium on turbulence, diffusion and air pollution; Reno, NV, USA (15 Jan 1979).

The potential impact on air quality of implementation of the National Energy Plan goal of a two-thirds increase in coal production by 1985 has been assessed for the land area west of 100 deg longitude. The analysis is based on an interpretation of best available control technology, siting scenarios obtained in the Oak Ridge National Laboratory Regional Studies Program, and a regional scale transport, transformation and removal model for SO_2 and sulfates. Results indicate that industrial coal use in southern California and utility coal use in northern Arizona may be constrained by regulations concerning prevention of significant deterioration in SO_2 concentrations. Neither industrial nor utility coal use appears to be limited by Montana and North Dakota state standards for sulfates. Maximum predicted ground-level concentrations of SO_2 and sulfate occur at about 63 km from the source. Most sulfur emissions in the western U.S. will ultimately be deposited in the region.

0110 Reserves And Exploration

REFER ALSO TO CITATION(S) 62624

62633 **(BMFT-FB-T—82-013) 3D-seismics with high resolution to image medium scale tectonics at the boundary overburden-carboniferous.** Heil, R.W.; Rueter, H.; Ameely, L.; Luetzenkirchen, K.; Ristow, D.; Houba, W.; Meixner, E. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Jan 1982. 224p. (In German). NTIS (US Sales Only), PC A10/MF A01. Order Number DE82750497.

A new type of 3D-seismics was developed to improve the vertical and horizontal resolution of the seismic image. This allows one to resolve medium scale tectonic elements at the overburden-carboniferous boundary, which are very important for coal mining. By extended field tests proper parameters for shots and geophone-groups as well as for the areal arrangement were developed. New processing techniques, including 3D-residual-statics and 3D-migration further improve the image of the subsurface. To interprete the enormous amount of information an interactive interpretation system was developed including hardware and software. Numerous examples demonstrate the good result of the FE-project compared to the aims given.

62634 **(NP—2906029) Determination of an exploration model for prospecting for lignite in the Alabama coastal plain.** Mancini, E.A. (Alabama Univ., University (USA). School of Mines and Energy Development). May 1982. 37p. NTIS, PC A03/MF A01. Order Number DE82906029.

Portions of document are illegible.

The primary objective of the research is to determine the depositional framework and geologic age of the Tertiary lignite-bearing sediments in Alabama. Determination of the geologic age of the units will permit accurate mapping of associated facies of a depositional system. Establishment of the depositional system will then provide a framework from which exploration models can be formulated. Such models can be employed as an exploration strategy in prospecting for lignite in the Alabama Coastal Plain and for estimating the amount and quality of lignite resources in Alabama. Results of the study are reported in this document. The Paleocene

Oak Hill lignite of the Naheola Formation has the most economic potential of the Paleogene lignites in southwest Alabama. The Oak Hill is the thickest and most continuous lignite, usually consisting of a single bed, 7 to 10 ft in thickness in surface exposures. These near-surface deposits are characterized on a moisture free basis as having 11.2 to 40.3% ash, 2.9 to 5.8% sulfur, 32.4 to 43.5% volatile matter, 27.3 to 47.5% fixed carbon, and a calorific value of 6360-10,570 Btu/lb. The lignite is usually overlain by interlaminated dark, gray, micaceous carbonaceous clay and silt or by cross-bedded, green-gray, micaceous, clayey, fine- to medium-grained quartz sand. It is underlain by mottled, dark gray, silty carbonaceous clay. In the subsurface, the Oak Hill lignite consists of 1 or 2 seams with the lower one being 6 to 11 ft in thickness. The deep-basin deposits appear to have greater economic potential than the near-surface lignites. The deep-basin lower lignite seam is characterized on a moisture free basis as having 10.6 to 13.5% ash, 1.1 to 4.1% sulfur, 40.8 to 51.1% volatile matter, 37.4 to 47.5% fixed carbon, and a calorific value of 11,560 to 13,610 Btu/lb.

0120 Mining

REFER ALSO TO CITATION(S) 62630

62635 (BMFT-FB-T—82-017) Testing the shearer loader EDW 170/200 LN for thin seams in connection with chainless haulage. Tegenthoff, J.; Klimek, K.H. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Jan 1982. 26p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82750504.

On account of decreasing average seam thicknesses and sometimes considerable problems encountered with the use of ploughs in these circumstances, investigations into cutting coal extraction will have to be extended beyond the previous limit of approx. 1.7 m seam thickness. Starting from the relevant requirement of minimum machine clearance combined with sufficient clearance underneath the machine and considering the desirable potential of additionally cutting gateroads along with the face, Messrs. Eickhoff, Bochum, manufactured the EDW 170/200 LN. The practical trials run in two panels of the Anna seam at Rossenray colliery (belonging to the Rheinland compound) were successful, apart from several modifications which were necessary. For further trials one should, however, try to increase both the drive performance and the traction force of the winch. For better utilization of machine potentials, rotational angle and positioning of the drum bodies are to be adapted to the LN concept.

62636 (DOE/ET/12394—2-Vol.1) Develop a winch-drawn dozer blade equipment system. Volume I. Development of a winch-drawn dozer blade system. Final report. Mathis, R.J. (Southwest Research Inst., San Antonio, TX (USA)). Jul 1982. Contract AC01-75ET12394. 119p. NTIS, PC A06/MF A01.

Portions of document are illegible.

A new approach to reclaiming the spoil areas produced by area-type mining operations has been developed. This system uses a machine known as a winch-dozer consisting of a pair of large back-to-back, scraper-type blades which are drawn by a wire rope across spoil piles, moving back and forth between a tailblock anchor and a drawworks winch unit developed as an attachment to a large crawler tractor. The program described in this report has produced a feasibility prototype system that was evaluated in operating mines. Based on operating performance and economic assessments of the feasibility prototype, the required characteristics of a production winch-dozer system were defined. The production system is a more cost-effective and energy efficient reclamation system compared to conventional techniques. Volume I of this report describes only those areas of the contract dealing with the design, development and testing of the winch-dozer system. Volume II of the report describes only those areas of the contract dealing with the development of a spoil-plane for leveling surface mine spoils.

62637 (DOE/ET/12548—14) Resource targets for advanced underground coal-extraction systems. Hoag, J.H.; Whipple, D.W.; Habib-Agahi, H.; Lavin, M.L. (Jet Propulsion Lab., Pasadena, CA (USA)). 1 Aug 1982. Contract AI01-76ET12548. 127p. (JPL-PUBL—82-15). NTIS, PC A07/MF A01. Order Number DE83000451.

This report identifies resource targets appropriate for federal sponsorship of research and development of advanced underground coal mining systems. In contrast to previous research, which focused on a particular resource type, this study made a comprehensive examination of both conventional and unconventional coals, with particular attention to exceptionally thin and thick seams, steeply dipping beds, and multiple seam geometry. The major thrust of the targeting analysis was forecasting which coals would be of clear commercial significance at the beginning of the 21st century under three widely different scenarios for coal demand. The primary measure of commercial importance was an estimate of the aggregate dollar savings realized by consumers if advanced technology were available to mine coal at prices at or below the price projected for conventional technology in the year 2000. Both deterministic and probabilistic savings estimates were prepared for each demand scenario. The results indicate that the resource of primary importance is flat-lying bituminous coal of moderate thickness, under moderate cover, and located within the lower 48 states. Resources of secondary importance are the flat-lying multiple seams and thin seams (especially those in Appalachia). The rather substantial deposits of bituminous coal in North Alaska and the deeply buried lignites of the Gulf Coast present transportation and ground control problems which appear to postpone their commercial importance well beyond 2000. Steeply dipping coals, abandoned pillars, and exceptionally thick western coals may be important in some regions or sub-regions, but the limited tonnage available places them in a position of tertiary importance.

62638 (DOE/ET/14052—2) Built-in test equipment (BITE) to improve front-end loader productivity. (McDonnell Douglas Electronics Co., St. Charles, MO (USA)). Dec 1981. Contract AC22-80ET14052. 38p. NTIS, PC A03/MF A01. Order Number DE82021320.

This report describes environmental and human factors tests to be performed on the BITE system to identify possible design deficiencies. Environmental tests include vibration, shock, temperature, humidity, spray, dust, and electromagnetic interference. Human factors tests will be conducted utilizing a mockup of a front end loader cab. 5 figures, 2 tables.

62639 (DOE/ET/14052—3) Built-in test equipment (BITE) to improve front-end loader productivity. Second topical report. (McDonnell Douglas Electronics Co., St. Charles, MO (USA)). May 1982. Contract AC22-80ET14052. 51p. NTIS, PC A04/MF A01. Order Number DE82021248.

Portions of document are illegible.

This report describes the results of a total systems test of an equipment system being developed to improve the availability and productivity of large front end loaders used in surface mining operations. The equipment will be mounted on the front end loader and includes an operator display and keypad, a microcomputer, machine sensors and a signal conditioner. Safety and machine performance alerts are displayed to the operator and a report is printed for the maintenance shop.

0130 Transport And Handling

REFER ALSO TO CITATION(S) 62596, 62622

62640 (DOE/PC/42268—T3) Ultrasonically enhanced size reduction of coal. Quarterly technical progress report No. 3, December 26, 1981-June 25, 1982. Tarpley, W.B. Jr.; Taylor, S.R. (Energy and Minerals Research Co., Exton, PA (USA)). Aug 1982. Contract AC22-81PC42268. 13p. NTIS, PC A02/MF A01. Order Number DE82021936.

Experimental work during the past quarter involved use of the roller/curved plate coupler grinder, with the Upper Freeport

and the Illinois coals as feed. In general, the results indicate that ultrasonic grinding leads to a narrow size distribution with minimal energy consumption. Furthermore, float-sink analyses of ultrasonically versus non-ultrasonically ground samples appear to indicate that selective fracturing is occurring during ultrasonic grinding. In order to further characterize the narrow size distribution achieved by ultrasonic grinding, an experiment was carried out in which a sample of Illinois No. 6 coal (9 mesh x 0) was ultrasonically ground; a comparison between the initial feed size distribution and the ground product size distribution was made. The median mass diameter was reduced from 500 microns to 250 microns while the amount of -200 mesh material remained essentially constant. Without classification, no other method will reduce particle size and give a narrower product size distribution simultaneously. 1 figure, 4 tables.

0140 Combustion

REFER ALSO TO CITATION(S) 62583, 62807, 62959, 62961, 62971, 62973, 63172, 63210, 63357, 63367, 63369

62641 **(CONF-8109180—1) Coal: an underutilized energy resource.** Cunningham, J.E. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 10p. NTIS, PC A02/MF A01. Order Number DE82022270.

From American Society for Metals symposium; Cincinnati, OH, USA (23 Sep 1981).

The most recent estimate of our national demonstrated coal reserves is 475 billion tons. Hence, coal has tremendous potential for providing additional energy. This paper reviews the status of selected elements in the national coal program; namely mining, direct combustion, and liquefaction. The general thrust and direction of the current effort in these areas is evaluated. Some background information and identification of materials problems as well as the technical and economic outlook for the various approaches being investigated are presented.

62642 **(DOE/ET/10815—63) High-temperature combustion of pulverized coal.** Holt, W.L. (Tennessee Univ., Tullahoma (USA). Space Inst.). Feb 1982. Contract AC02-79ET10815. 157p. NTIS, PC A08/MF A01. Order Number DE82022505.

Thesis. Submitted to Univ. of Tennessee, Knoxville.

During recent years there has been mounting interest in the combustion of coal under conditions of high heating rates and high final temperatures. This research was conducted in conjunction with a magnetohydrodynamics (MHD) coal-combustor development program conducted at The University of Tennessee Space Institute. Studies were made on the effects of mixing rate and residence time on the combustion of bituminous coal. Nominal heating rates of 105°K per second with final combustion temperatures on the order of 3000°K characterized the typical test conditions. The stoichiometry was nominally 0.90 with oxygen concentrations in the oxidant above 55%. The experimental results were compared to a theoretical coal combustion model involving a one-step, first order Arrhenius reaction rate constant. This model proved to be adequate for the test conditions being studied. Conclusions were reached as to the behavior of pulverized coal under flame conditions such as those that might be experienced in an MHD coal combustor. Qualitative information is presented as to the behavior of the coal particles during combustion and subsequent burn-out of the carbon. Recommendations for further work are presented along with recommendations for improving the coal combustion model.

62643 **(DOE/ET/15457—1229) Long term materials test program. Quarterly report, January-March 1982.** (General Electric Co., Schenectady, NY (USA). Advanced Energy Programs Dept.). Apr 1981. Contract AC21-79ET15457. 60p. NTIS, PC A04/MF A01. Order Number DE82020583.

Approximately 500 hours of corrosion validation testing have now been completed under the Long Term Materials Test. The severe corrosion on the material test specimens in the low velocity test section and formation of hard deposits in the high velocity test section during the first 250-hour test has been attributed to the high bed operating temperatures, 1800 to 1900°F peak temperatures, and the high potassium level in the dolomite. Recently, over 250-hours of operation at peak bed temperatures less than 1700°F, with both the high potassium dolomite (105 hours) and a dolomite of lower potassium content (153 hours), have shown that in these short exposures corrosion rates were minimal for most materials and plugging of the high velocity test section was not a problem. Further, these 250 test hours were performed in runs of 105, 82 and 71 hours without interruption demonstrating the capability for long periods of sustained operations. The in-bed heat exchanger erosion problem also appears to be solved. The single helix coil has operated for over 400 hours with no indication of erosion.

62644 **(DOE/PC/30296—7) PROF-COAL code user's manual, September 1980-August 1982.** Kelly, J.T.; Suttmann, S.T. (Acurex Corp., Mountain View, CA (USA). Energy and Environmental Div.). Aug 1982. Contract AC22-80PC30296. 113p. NTIS, PC A06/MF A01. Order Number DE82022221.

Portions of document are illegible.

The PROF-COAL computer code numerically models premixed coal/air combustion and NO/sub x/ pollutant formation events. The primary use of the code is to analyze pulverized coal fuel staging data to extract process mechanisms and rates. The code includes the important processes of gas phase chemistry and wall to gas heat and mass transfer. Particle volatilization and surface reaction as well as particle to gas heat and mass transfer and particle to wall heat transfer are also included. Several particle group sizes can be included to model particle size distributions. This PROF-COAL code user's manual describes the problem that can be treated by the code. It also describes the mathematical models and solution procedures applied to this problem. Complete input instructions and a description of output are given. A sample problem input and output listing are presented to demonstrate code operation. A program listing and code Fortran variable definition are also included in the manual.

62645 **(DOE/PC/40265—5) Computational tools for pulverized-coal combustion. Fifth quarterly report, April 1982-June 1982.** Oberjohn, W.J.; Cornelius, D.K.; Fiveland, W.A.; Schnipke, R.J.; Wang, J.H. (Babcock and Wilcox Co., Alliance, OH (USA). Research and Development Div.). Jan 1982. Contract AC22-81PC40265. 26p. (ARC—5274). NTIS, PC A03/MF A01. Order Number DE82021387.

This report summarizes the work conducted during the fifth quarter of a 30-month contract with the Department of Energy's Pittsburgh Energy Technology Center (DOE PETC). The general objective is to develop and verify a computer code capable of modeling the major aspects of pulverized-coal combustion. Achieving this objective will lead to design methods applicable to industrial and utility furnaces. The combustion model (COMO) consists of a number of relatively independent modules that represent the major processes involved in pulverized-coal combustion. These modules will be continually upgraded over the course of the contract. During this quarter, the initial evaluation of the gas-phase models continued, the definition of the solid-phase models was completed, and coding was initiated. A swirling-flow, gas-phase combustion evaluation run was completed and good agreement was obtained with predictions from a proprietary code based on similar models of the physics and chemistry. A nonswirling gas-phase combustion run was completed, and comparison to data and predictions available in the open literature was initiated. During the next quarter, testing of the individual solid-flow models will be completed, and the models will be combined to form an integrated solid-phase combustion model. Evaluation of this model will be initiated.

0150 Marketing And Economics

REFER ALSO TO CITATION(S) 62960, 63127

62646 **(NP—2906141) Rheinische Braunkohlenwerke AG Cologne.** (Rheinische Braunkohlenwerke A.G., Koeln (Germany, F.R.)). 1981. 51p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82906141.

This is the business report 1980 of the Rheinische Braunkohlenwerke with a report of the executive board on the following

topics: surface mining of brown coal and related problems as water industry, evacuations, recultivation and pollution control, coal purification as well as research and development with regard to solid, liquid and gaseous products on a brown coal basis. The annual accounting including the balance, the loss and profit account, as well as information on profit-sharing and business relations conclude the report.

0160 Health And Safety

62647 **(DOE/NBB—0008/1) Status of health and environmental research relative to solid wastes from coal conversion.** Francis, C.W.; Wobber, F.J. (comps.). (Battelle Pacific Northwest Labs., Richland, WA (USA); Los Alamos National Lab., NM (USA); Lovelace Foundation for Medical Education and Research, Albuquerque, NM (USA). Inhalation Toxicology Research Inst.; Oak Ridge National Lab., TN (USA)). Sep 1982. Contract W-7405-ENG-26. 120p. NTIS, PC A06/MF A01. Order Number DE83000036.

This document evaluates the status and makes recommendations about the future needs of health and environmental research relative to solid wastes from coal conversion processes. The objectives are to evaluate the health and environmental implications resulting from solid wastes generated on implementation of a commercial coal synfuel technology and identify research that will elucidate long-term effects of their disposal on human health and environment.

02 PETROLEUM

REFER ALSO TO CITATION(S) 63097

0201 Reserves

62648 **(NP—2906140) WEG - annual report 1980.** (Wirtschaftsverband Erdoel- und Erdgasgewinnung e.V., Hannover (Germany, F.R.)). 1981. 80p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82906140.

This is a report on the member firms within the WEG for the year 1980. Including the petroleum gas yield the natural gas production amounted to 18.9 billion m^3 or 32% of the natural gas consumption in the F.R. of Germany. The total petroleum home production decreased by 3% to 4.6 million tons. The natural gas reserves increased slightly and amount to 289 billion m^3 now while the petroleum reserves remained constant with 64 million tons. The foreign petroleum production could be increased by 0.6 million tons to 5.9 million tons.

0202 Geology And Exploration

REFER ALSO TO CITATION(S) 62626

62649 **Identification and geochemical significance of long chain acyclic isoprenoid hydrocarbons in crude oils.** Albaiges, J. (Inst. of Bio-Organic Chemistry (CSIC), Barcelona, Spain). *Physics and Chemistry of the Earth;* **12**: 19-28(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

A series of acyclic isoprenoid hydrocarbons with head-to-tail, tail-to-tail and head-to-head linkages are present as important components in petroleum. This paper presents some evidence for the occurrence of the extended series beyond the C_{40} isomers described to date. Thus, the regular head-to-tail homologs up to C_{45} have been identified, as well as a new C_{21}-C_{39} series, exhibiting methyl branches in the positions 3, 7, 11, 15,... of the molecule, which could derive from homologue members of the head-to-head series higher than C_{40}. To reinforce the mass spectrometric identification of these compounds their gas chromatographic behavior has been examined and retention indices of individual members compared with those predicted by retention increments. The relative abundance of the above series and the internal distribution of structural isomers in oils and rock extracts are considered as valuable parameters in correlation studies. Such distributions are geochemically significant from the standpoint of the origin and maturation of the sedimentary organic matter. Recent progress in the knowledge of the lipid composition of archaebacteria provides a definite argument for a substantial contribution of bacterial cell-wall lipids to petrogenesis.

62650 **Variation and significance of the C_{27} and C_{28} triterpane content of a North Sea core and various North Sea crude oils.** Grantham, P.J.; Posthuma, J.; de Groot, K. (Koninklijke/Shell, Rijswijk, Netherlands). *Physics and Chemistry of the Earth;* **12**: 29-38(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

Using gas chromatography - mass spectroscopy (GC-MS) analysis and GC retention data, high concentration (up to 51 ppM of rock) of 17αH-28-noradiantane (a bisnorhopane), previously reported to be a constituent of the Monterey oil shale, have been found in four samples of a core from the northern North Sea. These samples also contain a variable concentration of a C_{27} triterpane which, from mass-spectral evidence, appears to be a trisnormoretane. A fifth sample from the same core contains only traces of the bisnorhopane and the trisnormoretane is undetected. Combined GC-MS analysis of fractions isolated from a series of North Sea crudes reveals a significant but variable content of these C_{27} and C_{28} triterpanes. This variation is discussed with reference to possible precursor molecules and the depositional environment of the source rocks.

62651 **Characteristics of the evolution of organic matter in carbonate formations.** Fu, J. (Academia Sinica, Guiyang, China). *Physics and Chemistry of the Earth;* **12**: 39-50(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

Widespread in South China is a suite of well-developed and very thick carbonate formations (from Sinian to Triassic). In the present paper a brief discussion has been given to one of the characteristic features of the early evolution of organic matter in carbonate rocks - the great diagenetic loss of organic matter and its bearing on the evaluation of oil and gas prospects in carbonate rock-distributed areas. The author has also described the characteristic features of the evolution of organic matter, such as gaseous hydrocarbons, soluble organic matter and kerogen in carbonate rocks which have evidently reached the late stage of organic evolution, as well as the highest temperature range they once underwent during their evolution history. In terms of the vertical distribution patterns of oil and gas in the region of South Sichuan, the lowest limit has been preliminarily established for the commercial preservation of oil and gas in carbonate formations.

62652 **Correlation studies on crude oils and source-rocks in the German Molasse Basin.** Hufnagel, H.; Teschner, M.; Wehner, H. (Federal Inst. for Geosciences and Natural Resources, Hannover, Germany). *Physics and Chemistry of the Earth;* **12**: 51-66(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

Three types of oils can be distinguished in the German Molasse Basin according to their distributions of alkanes and aromatic hydrocarbons. GC-MS investigations, which till now have been restricted mainly to the analysis of steranes, have revealed the presence of only 2 oil families for which 2 different source-rocks must be assumed. We have tentatively concluded that the Tertiary oils have originated from Jurassic source-rocks of the Germanic facies, whereas the Triassic oils show some resemblance to Jurassic rocks of the Helvetian facies. The Tertiary foreland sediments have not yet been heated sufficiently to have generated oil.

62653 **Organic geochemical study of Mesozoic shales from Andoeya, North Norway.** Bjoroey, M. (Continental Shelf Inst., Trondheim, Norway); Hall, K.; Vigran, J.O. *Physics and Chemistry of the Earth;* **12**: 77-91(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

Andoeya, North Norway, is the only locality in Norway in which Mesozoic sediments outcrop onshore. Consequently, Andoeya has received special attention with respect to petroleum exploration on the Norwegian Continental Shelf north of 62°N. A series of outcrop samples of Cretaceous and Jurassic age was collected and analyzed. The samples produced varying amounts of extractable organic material, ranging from 120 to 320 ppM of the whole rock or 13.7 to 183.1 mg/g of total organic carbon (TOC) for the Cretaceous samples, and 250 to 5200 ppM of whole rock or 17.8 to 258.0 mg/g TOC for the Jurassic samples. Gas chromatographic analyses of the saturated hydrocarbon fractions showed distinct differences between the 2 sets of samples (Cretaceous and Jurassic). The Jurassic samples have a pronounced distribution of high molecular weight (C/sub 23+/) compounds and high CPI values whereas the Cretaceous samples have a large unresolved envelope in the n-C_{15}-n-C_{20} region. Large variations in the composition of the saturated hydrocarbon fractions are recorded in the Jurassic samples. Some contain rather large quantities of isoprenoids while others contain minor amounts only. A high proportion of polycyclic aliphatic compounds was found in some samples. Various steranes and triterpanes were identified by GC-MS, and the variations in relative abundances of these compounds are discussed relative to the other parameters studied. Rock-Eval pyrolysis, together with visual kerogen and vitrinite reflectance analyses were undertaken on certain samples and showed a higher maturity for the Cretaceous than for the Jurassic samples.

62654 **Hydrocarbon generation in a super-thick Neogene sequence in south-east Hungary. A study of the extractable organic matter.** Sajgo, C. (Hungarian Academy of Sciences, Budapest). *Physics and Chemistry of the Earth;* **12**: 103-113(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

In young sediments, petroleum generation takes place at relatively high temperatures, but no detailed data concerning petroleum generation in Pliocene sediments have been published so far. Based on the chloroform-soluble (CBA) and benzene-ethanol-soluble (BABA) bitumens the threshold value of intense petroleum generation appears to be 142°C in the well studied. The corresponding sedimentary formation is about 8 million yr old and its depth is 3450 m. Intense hydrocarbon generation is observed down to the well bottom at 5842.5 m (15 to 16 million yr, 233°C), with an apparent gap of about 400 m at 5050 to 5450 m. In spite of the high temperature, the cracking and decreasing abundances of bitumens and hydrocarbons are barely observed. The quantitative increase in the lighter C_{14}-C_{20} has been produced partly by a change in the type of the organic matter.

62655 **Geochemistry of n-alkanes with an even-odd predominance in the Tertiary Shahejie Formation of northern China.** Shen, G.; Fan, S.; Lin, D.; Su, N.; Zhou, H. (Academia Sinica, Guiyang, China). *Physics and Chemistry of the Earth;* **12**: 115-121(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

The present paper reports the distribution of C_{22}-C_{34} n-alkanes with a high even-odd (EOP) predominance in the source rocks, and crude oil of the Shahejie Formation (Tertiary) of northern China. Samples were taken from Section 5 of the Shahejie Formation at the Shengli oil field. Analyses of the n-alkanes have given the undernoted results. There is a remarkable even-odd n-alkane predominance in the C_{22}-C_{34} range. The corresponding coincidence of the EOP distribution curve with the OEP distribution curve, for the same region, may indicate that organic matter in the source rocks and crude oils of these 2 types has come from the same precursor, namely terrestrial higher plants rich in lipids; this is supported by microscopical examination of the organic matter. The difference lies in the fact that samples with a high even-odd n-alkane predominance occur in a highly saline geological environment in which evaporites, gypsum and carbonates are closely associated. From our calculations, it appears that the EOP distribution of n-alkanes discovered in source rocks and crude oils has extended the lower limit of OEP values (down to about 0.5) and hence it may be used in the correlation of source rocks and crude oils.

62656 **Effect of an igneous intrusion on maturation of organic matter in Lower Jurassic shales from NW-Germany.** Leythaeuser, D.; Altebaeumer, F.J.; Schaefer, R.G. (Kernforschungsanlage, Juelich, Germany). *Physics and Chemistry of the Earth;* **12**: 133-139(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

This paper deals with geochemical maturation effects in a source bed-type Lower Jurassic shale unit (Lias δ) which were caused by this intrusion. Most samples for this study were obtained by drilling a series of shallow core holes into outcrops of this shale unit. Locations were selected to provide at uniform stratigraphic level a complete sample sequence from immature through optimum mature into overmature stages (mean vitrinite reflectance 0.33 to 2.10% anti R_o). Geochemical results of this study reveal regular changes of yield and composition of light (C_2-C_8) and heavy (C/sub 15+/) hydrocarbons in the Lias δ shale with proximity to the igneous intrusion of the Bramsche Massiv. A mass balance for the thermal evolution of C/sub 15+/-saturated hydrocarbons revealed generation of n-alkanes to be most effective during maturation increment 0.40 to 0.95% anti R_o, whereby generation rates sharply decrease with increasing chain length. Cracking of n-alkanes occurs first during maturation interval 0.95 to 1.40% anti R_o affecting the C/sub 27+/-range. At a maturation level of 2.10% anti R_o, thermodynamically most stable light hydrocarbons (gas range and aromatics) remain preferentially.

62657 **Analysis of trace amounts of hydrocarbons (C_2-C_8) from rock and crude oil samples and its application in petroleum geochemistry.** Schaefer, R.G.; Leythaeuser, D. (Kernforschungsanlage, Juelich GmbH, Germany). *Physics and Chemistry of the Earth;* **12**: 149-156(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

A hydrogen stripping method has been developed to extract and analyse trace amounts of hydrocarbons (C_2-C_8 molecular range) from rock samples in a single-step, rapid procedure (complete analysis time ~ 40 min). In detail, a crushed rock sample (less than 1 g) is placed in the flow system of a capillary gas chromatograph, the carrier gas serving as the stripping gas. Splitless introduction of the hydrocarbons accumulated in a cold trap ensures high sensitivity (10^{-9}%-w/w of rock). Isothermal GC analysis allows the application of KOVATS retention indices for compound identification. With a slight modification the hydrocarbon composition of crude oils can be determined by the same procedure. The following applications of this type of analysis to petroleum geochemistry are described using examples from several exploration wells: (1) light hydrocarbon generation in subsurface sediments with depth and temperature increase, and as a function of kerogen type; (2) oil-oil and oil-source-rock correlation based on compositional similarities of the light hydrocarbons; and (3) detection of biodegradation in reservoir oils.

62658 **Hydrocarbon gases in the soils of Carroll County, Maryland - a metamorphosed region.** Wood, M.B. (Standard Oil Co., Cleveland, OH). *Physics and Chemistry of the Earth;* **12**: 177-180(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

The ubiquity of the light hydrocarbon gases in the soils of petroleum provinces raised the question of their origin. To determine if there were any sources other than seepage from petroleum deposits and petroleum containing formations, the soil-gas hydrocarbon levels were measured in the Piedmont Province of the Appalachian Mountains, which is a metamorphosed region. The levels found are far lower than those in petroleum-producing areas, and much higher than atmospheric concentration levels. The hydrocarbons in the metamorphosed region are postulated to be the ancient fragments of the organic material present in the sedimentary rocks prior to metamorphism.

62659 **Effect of thermal stress on source-rock quality as measured by hopane stereochemistry.** Seifert, W.K.; Moldowan, J.M. (Chevron Oil Field Research Co., Richmond, CA). *Physics and Chemistry of the Earth;* **12**: 229-237(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

Whether or not a suspected source-rock has experienced sufficient thermal stress to have generated petroleum can be determined by GCMS analysis of the terpanes using the following criteria in both the rock extract and the pyrolyzate: (1) 22S/22R ratio of C_{31}-C_{33} hopanes, (2) concentration of C_{29}-C_{32} β,β hopanes, (3) ratio of 17 βH/17αH trisnorhopanes, (4) ratio of moretanes/hopanes, and (5) yield of saturates in the pyrolyzates. The use of these parameters in combination is demonstrated with a sequence of suspected source rocks of different stratigraphic horizons from the same basin, ranging from immature/poor to mature/excellent. Of specific value is the subtle graduation, particularly in the pyrolyzates, of these parameters throughout the samples of different degrees of maturity. Cross-supplementing between parameters is demonstrated.

62660 **Molecular parameters of maturation in the Toarcian shales, Paris Basin, France. II. Evolution of metalloporphyrins.** Mackenzie, A.S.; Quirke, J.M.E.; Maxwell, J.R. (Univ. of Bristol, England). *Physics and Chemistry of the Earth;* **12**: 239-248(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

The distributions of nickel (II) and vanadyl alkyl porphyrins in a suite of Toarcian shales from the Paris Basin have been examined as the demetallated compounds by high performance liquid chromatography and mass spectrometry. The suite covers a wide range of burial history. Among the major changes which occur in the vanadyl species with increasing maximum depth of burial are: (1) conversion of DPEP components to etio components, (2) a decrease in the chain lengths of the β alkyl substituents, and (3) a decrease in the ratio of Ni to V double bond O porphyrins. In addition, evidence is presented for the generation of higher molecular weight species (C_{35}-C_{39}) below 2000 m maximum burial depth. These appear to arise by thermal cracking of the kerogen. Within the shallow samples the Ni species undergo the DPEP to etio conversion and decrease of alkyl chain length before the V double bond O species. These changes indicate, for the shallow samples, an increase in the extent of maturation from north to south across the basin.

62661 **Identification of aromatic geochemical markers by quasilinear Shpolskii fluorescence spectra at 4 K in extracts from marine sediments and petroleum.** Ewald, M. (Univ. Bordeaux I, Talence, France); Lamotte, M.; Redero, F.; Tissier, M.J.; Albrecht, P. *Physics and Chemistry of the Earth;* **12**: 275-279(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

Quasi-linear fluorescence spectra are obtained at 4 K when polycyclic aromatic hydrocarbons are included in n-heptane (Shpolskii effect). This technique is applied to the identification of phenanthrene, 1-methyl and 9-methyl phenanthrenes petroleum fractions obtained by high pressure liquid chromatography. In aromatic extracts of marine sediments phenanthrene, 9-methyl phenanthrene and pentacyclic chrysene derivatives are detected.

62662 **Acyclic isoprenoid alkanes and geochemical maturation.** Patience, R.L. (Univ. of Bristol, England); Yon, D.A.; Ryback, G.; Maxwell, J.R. *Physics and Chemistry of the Earth;* **12**: 287-293(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

The configuration of phytane (2,6,10,14-tetramethylhexadecane) in Rozel Point crude oil (age unknown) has been determined by oxidation to a mixture of carboxylic acids and gas chromatographic analysis of their methyl and (-)-methyl esters. The alkane comprises a mixture of all 8 isomers, with equal proportions of the R and S configurations at C_{10} and C_{14}, but with a slight preference for the R configuration over the S configuration at C_6. Taken with earlier studies, this result suggests that isomerization at the chiral centres in acyclic isoprenoid alkanes with increasing thermal maturation is a general phenomenon in such compounds.

62663 **Possible interactions of insoluble organic geopolymers (kerogen) with organic compounds in the aquatic environment. I. Interaction with fatty acid methyl esters.** Ishiwatari, R.; Yamamoto, S.; Fukushima, K. (Tokyo Metropolitan Univ., Japan). *Physics and Chemistry of the Earth;* **12**: 495-503(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

A laboratory experiment was designed to evaluate the role of kerogen as a carrier and agent of transformation for other organic compounds in aquatic environments. This paper deals with the results of a study of the interaction of kerogens with fatty acid methyl esters. (FAMes). Kerogens were isolated from a river (polluted) and a lake (non-polluted) sediment and examined for the extent of their interaction with both saturated and unsaturated FAMes at different concentrations and temperatures (20 and 60°C). A significant amount of FAMes was incorporated into the kerogens under the experimental conditions used. The saturated FAMes were almost completely recoverable by organic solvent extraction. The unsaturated FAMes reacted rapidly with the lake kerogen, and were not recovered by organic solvent extraction. In contrast, they reacted to a lesser extent with the river kerogens. The differences in reactivity between the lake and river kerogens is interpreted in terms of kerogen formation and development history.

62664 **Experimental simulation of the natural transformation of kerogen.** Monin, J.C. (Institut Francais du Petrole, Rueil-Malmaison, France); Durand, B.; Vandenbroucke, M.; Huc, A.Y. *Physics and Chemistry of the Earth;* **12**: 517-530(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

Analytical techniques such as elemental analysis, infrared spectroscopy, ESR, dark-field electron microscopy and reflectance analysis applied to kerogens enables the geochemist to describe how they evolve at depth. Simulation of this evolution is obtained by the temperature-programmed heating of immature samples in a stream of inert gas. Comparison of naturally occurring samples at increasing stages of maturation, and artificially matured samples demonstrates that this simulation generally reproduces the overall characteristics of evolution at depth. However, agreement is better for hydrogen-rich than for oxygen-rich kerogens. In fact, oxygen is eliminated in nature, and in the laboratory, by different mechanisms. In nature, elimination takes place mainly at the beginning of burial. Temperatures used in the laboratory are necessarily much higher and appear to cause secondary reactions which favor water formation. Elimination of hydrogen occurs, during natural maturation, at greater depths and temperatures - i.e., in the oil and gas formation zone. Therefore, laboratory simulation is better for kerogens which have already reached the oil formation stage. Hydrocarbons released by natural and laboratory-simulated maturation are compared. Although quantities and distributions are different, similarities exist which can be used, to a first approximation, to predict the distribution of hydrocarbons obtained from naturally-evolving kerogens.

62665 **Laboratory-simulated thermal maturation of Recent sediments.** Peters, K.E.; Rohrback, B.G.; Kaplan, I.R. (Univ. of California, Los Angeles). *Physics and Chemistry of the Earth;* **12**: 547-557(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

Samples of 2 Recent sediments, one containing humic and the other containing sapropelic proto-kerogen, were heated under a partial helium atmosphere at various temperatures and times. The isolated kerogens were characterized by elemental analysis, pyrolysis, vitrinite reflectance, electron spin resonance, and stable isotopes of carbon, nitrogen, and hydrogen. The study shows that elemental compositions of laboratory heated proto-kerogens do not evolve along the same evolution paths as natural kerogens, which experience thermal maturation due to burial. A temperature-time dependent set of constructive and destructive reactions plays a role in determining the quantity and quality of kerogen in each sample.

Short-term, high-temperature heating, typical of many laboratory simulations of burial maturation, results in selective degradation of heat-labile fractions of the kerogen and loss of free-lipids. Stabilization of these components may occur by cross-linkage and binding of free lipids in lower temperature, longer term heating experiments or during natural burial. Pyrolysis indicates 2 distinctly nonlinear changes in T/sub max/ (the Rock-Eval temperature for maximum generation of hydrocarbons) as a function of atomic H/C or vitrinite reflectance. These 2 changes or jumps appear to define the boundaries of the oil generation window for sapropelic kerogen. The higher temperature jump closely corresponds to a sharp peak in ESR spin density, and suggests a complete reorganization of molecular structure after the oil deadline.

62666 **Thermal degradation of metal-complexed humic substances.** Ioselis, P.; Ikan, R.; Frenkel, M. (Hebrew Univ. of Jerusalem, Israel). *Physics and Chemistry of the Earth;* **12**: 567-577(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

A series of humic acid (HA) metal (Fe, Al) complexes were prepared and subjected to thermogravimetric and spectroscopic studies. The activation energies of decarboxylation were found to be 6 to 9 kcal/mole. H_2O and CO_2 accounted for the main weight loss of HA and its complexes. No distinction could be made between organic and inorganic sources of water. Interaction of Fe^{3+} with HA at a low pH probably causes reactions, such as oxidation of phenols to quinoids, transamination, decarboxylation, etc. This is supported by i.r. spectroscopy and elemental analysis. It is assumed that humic acids fixed on clays might possess thermal properties similar to those of the HA oxidized by Fe^{3+} at low pH.

62667 **Analysis of kerogens by pyrolysis-gas chromatography-mass spectrometry using selective ion monitoring. III. Long-chain alkylbenzenes.** Solli, H.; Larter, S.R.; Douglas, A.G. (Newcastle upon Tyne Univ., England). *Physics and Chemistry of the Earth;* **12**: 591-597(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

Analysis of the 3 principal kerogen types by pyrolysis-gas chromatography-mass spectrometry (P-GC-MS) has been undertaken using the mass spectrometer as a selective ion detector. By monitoring the fragment ions with m/e values of 91, 105 and 119 information has been obtained concerning differences in the content of long-chain alkylbenzenes in the kerogen pyrolysates, thus implying differences in the kerogen structures. Simulated maturation of the kerogens followed by specific ion (m/e 105) gas chromatographic-mass spectrometric (GC-MS) analysis of the extracted liquid products, and specific ion (m/e 105) GC-MS analysis of 3 crude oils is also described. The use of long-chain alkylbenzenes for geochemical correlation studies is discussed.

0203 Drilling And Production

62668 **(DOE/BC/10033—3) BOAST: a three-dimensional, three-phase black oil applied simulation tool (version 1.1). Volume I. Technical description and Fortran code.** Fanchi, J.R.; Harpole, K.J.; Bujnowski, S.W. (Keplinger and Associates, Inc., Tulsa, OK (USA); BDM Corp., Bartlesville, OK (USA)). Sep 1982. Contract AC19-80BC10033. 184p. D. Order Number DE83000529.

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This report provides technical information about a newly developed three-dimensional, three-phase black oil simulator. The documentation includes the code for the black oil applied simulation tool (BOAST), and is presented such that it can be readily used by the public. The simulator is an upgraded version of the simulator developed by Sawyer and Mercer (1978). Volume I contains a discussion of the methods used in deriving the flow equations, converting them to finite difference form, solving the subsequent linear algebraic systems, and evaluating the results. Volume II is a program user's manual. BOAST is designed to be an easy-to-use program which would be suited to simulation of primary depletion, pressure maintenance by water and/or gas injection, and basic secondary recovery operations (such as waterflooding) in a black-oil reservoir. BOAST contains only an IMPES formulation with direct elimination (BAND and D4) and LSOR solution options. It can be used to evaluate many of the common field production situations and it should be competitive with, if not faster than, commercially available simulators.

62669 **(DOE/ET/12053—26) Improved oil recovery by alkaline flooding in the Huntington Beach Field. Final report.** Campbell, T.C. (Aminoil USA, Inc., Huntington Beach, CA). Oct 1982. Contract AC03-77ET12053. 40p. NTIS, PC A03/MF A01. Order Number DE83001192.

A pilot test of an alkaline flooding process for improved oil recovery is being conducted by Aminoil USA in the Lower Main Zone of the Huntington Beach Field. This field was developed in 1940 with primary production continuing through 1969. At that time, a pilot waterflood was initiated in Fault Blocks 22/23 using a 5-spot pattern with four injection wells. Approximately two pore volumes of water had been injected into this area prior to initiation of the alkaline flooding pilot. A softened water preflush was started in June, 1978 in the same pattern used for the waterflood pilot following redrilling of two injection wells and workover of several production wells in the pilot area. The softening plant was designed for an injection rate of 10,000 B/D. Soft water preflush injection continued through March 1980. A series of organic, inorganic and radioactive tracers were injected in October 1979 to monitor fluid movement in the pilot area. In March 1980, alkaline injection at a concentration of 0.2% by weight of sodium orthosilicate solution was begun. The concentration of alkali was increased to 1.0% by weight in October 1980 and has been continued at this level to the present time. Alkaline injection will be continued through 1984. A short postflush with softened water will be injected prior to continued injection with field produced water to the economic limit of the pilot area. Preflush breakthrough has occurred in three of the production wells, as measured by reductions in salinity and water hardness. The tracers have not been detected at any significant levels, except for tritium. Oil production has followed a typical waterflood decline over the period of pilot operation. There has been no significant response to the alkaline injection, but there has been an indication of decreases in the water/oil ratio in the central producer in the inverted 5-spot pattern area. 18 figures, 5 tables.

62670 **(DOE/MC/05301—86) Rock Creek Carbon Dioxide Pilot Project. Annual report, July 1980-June 1981.** King, P.E. Jr. (Pennzoil Exploration and Production Co., Vienna, WV (USA)). Sep 1982. Contract AC21-76MC05301. 72p. NTIS, PC A04/MF A01. Order Number DE83000029.

Portions of document are illegible.

Although this pilot has yet to prove that an expanded carbon dioxide flood in the Rock Creek Big Injun reservoir would be economically feasible, the pilot has been technically successful in several aspects. First of all, the mechanical operation of the project has proceeded smoothly in comparison to similar projects in the industry. Through this work, much experience has been gained (both mechanically and in reservoir engineering) that may be helpful in future projects of this nature. Also, from the production response to carbon dioxide injection and the Shaffer OB-2 core analysis, the miscible carbon dioxide injection displacement mechanism is moving oil. The amount of oil to be recovered, the time required, and the amount and cost of carbon dioxide injection required to produce this oil will all have a very significant effect on the economics of this project. 3 figures.

62671 **(NP—2905312) Enhanced oil recovery for the future.** (Van Poollen (H.K.) and Associates, Littleton, CO (USA)). Mar 1981. 25p. H.K. van Poollen and Associates, Inc., 1100 W. Littleton Blvd., Littleton, CO 80120.

Concepts of enhanced oil recovery are discussed in this report. It is estimated that more than 50% of the known oil is unrecoverable by existing primary and secondary recovery methods. The new idea discussed is to let time play a role to allow diffusion and gravity forces to reaccumulate the oil. The Appendix contains descriptions of: the state of the art; thermal processes (steam, steam soak, steam drive, in-situ combustion); chemical processes (surfactant, micellar dispersions, polymers, caustic), miscible hydrocarbon displacement; and carbon dioxide displacement. (DMC)

62672 **Biodegradation of crude oil in the Aquitaine basin.** Connan, J. (Societe Nationale Elf Aquitaine, Pau, France); Restle, A.; Albrecht, P. *Physics and Chemistry of the Earth;* 12: 1-17(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

Two crude oils from the Aquitaine basin (SW France) have been subjected to in vitro biodegradation with the bacterium Pseudomonas oleovorans for periods ranging from five days to three months. A rapid disappearance of the linear, branched and isoprenoid structures is observed in the alkane fraction. The degree of alteration is highly dependent upon the quality of the initial material but the residual oils, obtained after biodegradation of either immature or moderately mature crudes, display a virtually identical alkane distribution. Such a distribution is also observed in natural asphalts i.e., heavily biodegraded crudes from the Aquitaine tar belt or in crude oils biodegraded in soils from well sites. This alkane distribution displays a high concentration of tri-, tetra- and pentacyclic alkanes. These polycyclic alkanes, organized into several ubiquitous families in the Aquitaine crudes, remain unchanged by bacterial attack either in the laboratory or in nature (soils, boreholes). They therefore represent several classes of compounds that should be of potential interest to correlate unaltered to biodegraded crudes in other basins. Among the families of polycyclics which are ubiquitous in the Aquitaine crudes, we find a novel group of 4 low mol wt steranes (a C_{21} and a C_{22} sterane, a C_{23} and a C_{23} 4 methylsterane), a series of tricyclic terpanes (C_{19}-C_{26}) a series of tetracyclic terpanes (C_{24}-C_{26}) and the α-β hopane series (C_{27}-C_{35}).

0204 Processing

REFER ALSO TO CITATION(S) 62684

0205 Products And By-products

REFER ALSO TO CITATION(S) 62588

0207 Marketing And Economics

REFER ALSO TO CITATION(S) 62648

0208 Waste Management

REFER ALSO TO CITATION(S) 63575

0209 Environmental Aspects

62673 **(USGS-OFR—81-317) Modeling the cumulative onshore effects of offshore oil and gas development.** Smith, E.T.; Hecht, L.G. Jr. (Geological Survey, Reston, VA (USA). Office of Resource Planning Analysis). Jun 1981. 20p. Resource Planning Analysis Office, 750 National Center, Reston, VA 22092.

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Modelling Outer Continental Shelf (OCS) oil and gas developments and effects involves the use of a variety of planning and analysis techniques. This paper concerns onshore aspects of the OCS oil and gas development process; however, planning for onshore activities requires an understanding of the scale, magnitude, and timing of offshore activities that trigger onshore actions. A number of factors usually influence the numbers and kinds of onshore facilities that eventually locate in an area, given marketable discoveries of oil and gas. Generally, these include the discovered recoverable reserves of oil and gas in an offshore basin, the number and size of oil and gas fields discovered over time, production platform requirements, timing of field development and production operations, and the location and means of product transportation and processing. The sequence of events that occurs during the oil and gas leasing, exploration, development, and production process is the subject of this study. Following the introduction, the following topics are discussed: modelling requirements; magnitude and timing of offshore activity; onshore facilities and their impacts; regional analysis; state analysis; cumulative effects.

0210 Legislation And Regulation

REFER ALSO TO CITATION(S) 63120

0230 Properties

REFER ALSO TO CITATION(S) 62585

62674 **(CONF-821106—5) Applications of multiproperty analysis in the prediction of complex-system thermophysical behavior.** Brule, M.R.; Starling, K.E. (Kerr-McGee Corp., Oklahoma City, OK (USA); Oklahoma Univ., Norman (USA)). 1982. Contract FG22-80PC30249. 43p. NTIS, PC A03/MF A01. Order Number DE82020859.

From Annual meeting of heat transfer and energy conversion; Los Angeles, CA, USA (14 Nov 1982).

Portions of document are illegible.

The Therm-Trans method is presented for predicting compound characterization parameters (e.g., critical properties) used in multiparameter corresponding-states correlations. The technique employs multiproperty analysis of thermodynamic and transport data. Most of the property data utilized is similar to the inspection data obtained for pseudocomponent fractions resolved from a standard TBP-distillation analysis of a complex organic mixture. These property data include vapor pressure, density, and viscosity-the analogues for fraction inspection data such as average boiling temperature, specific gravity, and kinematic viscosity. The new approach for determining correlation parameters altogether circumvents the need for critical-property data per se. Thermophysical-property data for over fifty organic compounds, including high-molecular-weight linear hydrocarbons present in petroleum, and polycyclic organic compounds typical of coal-derived fluids, have been used to develop the property correlations and establish the feasibility of the characterization technique. The correlations and characterization method are applied effectively to both petroleum- and coal-liquid fractions. Deviations of volatility, density, and viscosity predictions are less than 10% in most cases.

62675 **(DOE/BETC/RI—82/4) Trends in motor gasolines: 1942-1981.** Shelton, E.M.; Whisman, M.L.; Woodward, P.W. (Department of Energy, Bartlesville, OK (USA). Bartlesville Energy Technology Center). Jun 1982. 31p. NTIS, PC A03/MF A01. Order Number DE82021124.

Trends in motor gasolines for the years of 1942 through 1981 have been evaluated based upon data contained in surveys that have been prepared and published by the Bartlesville Energy Technology Center (BETC). These surveys have been published twice annually since 1935 describing the properties of motor gasolines from throughout the country. The surveys have been conducted in cooperation with the American Petroleum Institute (API) since 1948. Various companies from throughout the country obtain samples from retail outlets, analyze the samples by the American Society for Testing and Materials (ASTM) procedures, and report data to the Bartlesville center for compilation, tabulation, calculation, analysis and publication. A typical motor gasoline report covers 2400 samples from service stations throughout the country representing some 48 companies that manufacture and supply gasoline. The reports include trend charts, octane plots, and tables of test results from about a dozen different tests. From these data in 77 semi-annual surveys, a summary report has thus been assembled that shows trends in motor gasolines throughout the entire era of winter 1942 to 1943 to the present. Trends of physical properties including octane numbers, antiknock ratings, distillation temperatures, Reid vapor pressure, sulfur and lead content are tabulated, plotted and discussed in the current report. Also included are trend effects of technological advances and the interactions of engine design, societal and political events and prices upon motor gasoline evolution during the 40 year period.

62676 **Investigation of nitrogen bases from petroleum.** Schmitter, J.M.; Vajta, Z.; Arpino, P.J. (Ecole Polytechnique, Palaiseau, France). *Physics and Chemistry of the Earth;* 12: 67-76(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

Nitrogen containing bases from various crude oils were analyzed by combinations of chromatographic (gas and liquid), mass spectrometric (electron impact and chemical ionization mode), and UV spectroscopic methods. Optimized and complementary techniques, together with a selective extraction step, are necessary for the elucidation of the chemical structures of these highly polar and high-boiling substances. The isolated compounds are mainly monoaza-arenes with from 2 to 8 fused aromatic rings. They were found to occur in almost identical distributions in every crude oil which we have analyzed.

62677 **Oil-oil and oil-condensate correlation by low eV GC-MS measurements of aromatic hydrocarbons.** Rullkoetter, J.; Welte, D.H. (Kernforschungsanlage, Juelich GmbH, Germany). *Physics and Chemistry of the Earth;* **12**: 93-102(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

Molecular ion distributions obtained by low voltage GC-MS measurements of aromatic hydrocarbon fractions are used for oil-oil and oil-condensate correlation in cases where the concentration of tetra- and pentacyclic biological marker compounds in the saturated hydrocarbon fractions is insufficient (e.g., most condensates, old and very mature oils). Correlation is performed by comparing distribution curves of homologous molecular ion series or, for large sample numbers in regional basin studies, by cluster analysis of up to 70 most significant molecular ions. Examples show that positive correlations can be achieved, even where there is a large vertical separation of genetically related hydrocarbons. Furthermore, it is demonstrated that the method can be applied, with some limitations, to biodegraded oils.

62678 **Separation and structure of petroporphyrins.** Barwise, A.J.G.; Whitehead, E.V. (BP Research Centre, Sunbury-on-Thames, England). *Physics and Chemistry of the Earth;* **12**: 181-192(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

A novel separation scheme using alkyl sulphonic acid functionalized silica was applied to the separation of Boscan vanadyl porphyrins. Excellent recovery of porphyrinic material was obtained (93%). The porphyrins were analyzed by mass spectrometry and high performance liquid chromatography. Five metalloporphyrin series were observed - DPEP, Etio, Di-DPEP, Rhodo-Etio and Rhodo-DPEP. The green rhodoporphyrins were separated from the red porphyrins by thin-layer chromatography. The porphyrins ranged from C_{25} to above C_{30}. The alkylation pattern was determined by chromic acid degradation of metal-free porphyrins to maleimides. A major series of methyl n-alkyl maleimides from C_1 to C_8 was observed, along with several minor isomers. Two phthalimides were also present which confirm the benz-structure of rhodoporphyrins.

62679 **Petroporphyrins: structural elucidation and the application of HPLC fingerprinting to geochemical problems.** Eglinton, G.; Hajibrahim, S.K.; Maxwell, J.R.; Quirke, J.M.E. (Univ. of Bristol, England). *Physics and Chemistry of the Earth;* **12**: 193-203(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

The petroporphyrins of Gilsonite (Eocene, Uinta Basin, Utah, USA) were separated by a variety of chromatographic procedures to yield seven aetio porphyrins and four DPEP porphyrins as largely single carbon number components. The structures of four of the components were determined by mass spectrometry, ^1H NMR, oxidative degradation and HPLC coinjection data, and provide the first firm supporting structural evidence for the Treibs hypothesis that the petroporphyrins were produced directly by defunctionalization of chlorophyll a. The HPLC fingerprinting (SiO_2 columns) of porphyrin distributions from a range of geological samples is revealed as a valuable tool in the correlation of oils with oils and with source rocks. The technique can be augmented by the use of non-aqueous reverse phase columns. Combining the structural elucidation and fingerprinting data should result in the clarification of the diagenesis of porphyrins.

0240 Storage

62680 **(GAO/EMD—82-112) Progress in filling the Strategic Petroleum Reserve continues, but capacity concerns remain.** (General Accounting Office, Washington, DC (USA). Energy and Minerals Div.). 15 Jul 1982. 31p. General Accounting Office, PO Box 6015, Gaithersburg, MD 20760.

During the first three quarters of fiscal year 1982, the Government filled the Strategic Petroleum Reserve (SPR) at an average rate of 237,000 barrels per day. As of June 30, 1982, the Department of Energy reported that the Reserve contained 264.1 million barrels of oil. The Government has nearly filled the currently available permanent storage capacity. In the future, the SPR fill rate will depend on the rate at which new capacity can be developed. This report discusses several problems which could affect the development of additional capacity.

0250 Combustion

REFER ALSO TO CITATION(S) 62675, 63369

62681 **(DOE/PC/30299—T5) Experimental investigation of synfuel spray characteristics and combustion dynamics. Quarterly technical progress report, January 1-March 31, 1982.** (Spectron Development Labs., Inc., Costa Mesa, CA (USA)). Apr 1982. Contract AC22-80PC30299. 36p. (SDL—82-2176-35Q). NTIS, PC A03/MF A01. Order Number DE82021563.

Portions of document are illegible.

The primary objective of this project is to obtain fundamental information on the characteristics and behavior of both petroleum-based oils and synthetic fuels in spray combustion by applying advanced optical diagnostic techniques to study the processes of fuel injection and atomization, droplet ignition, and spray flame combustion. Efforts during the sixth quarter of this program were directed at (1) the completion of the spray formation study using SRC-II middle distillate, (2) comparison of spray formation characteristics for petroleum (No. 2 and No. 6) and coal derived synthetic (SRC-II middle distillate) fuels, and (3) initiation of monodisperse droplet combustion study utilizing droplet sizing technique to size both cold and burning droplet streams.

03 NATURAL GAS

REFER ALSO TO CITATION(S) 63097

0301 Reserves

REFER ALSO TO CITATION(S) 62648

0302 Geology And Exploration

REFER ALSO TO CITATION(S) 62626, 62651, 62656, 62658, 62664, 62696

62682 **(DOE/MC/16463—T4) Geomorphology of portions of western Kentucky and adjacent areas.** Dilamarter, R.C. (Michigan Univ., Ann Arbor (USA). Dept. of Geological Sciences; Western Kentucky Univ., Bowling Green (USA)). Jul 1982. Contract AC21-81MC16463. 35p. NTIS, PC A03/MF A01. Order Number DE82022306.

Portions of document are illegible.

The geomorphology of portions of western Kentucky and adjacent areas in Indiana, Illinois and Tennessee is presented as a background for interpreters evaluating the present land surface using remotely sensed imagery. Eight physiographic units were analyzed and are briefly discussed with reference to topography and surface deposits. Great diversity was found to be characteristic of the region, the result of different structural influences and geomorphic processes. The landscape bears the marks of fluvial, glacial, eolian, lacustrine and karstic environments, so a regional geomorphic history was compiled from the literature as an aid to un-

derstanding the land surface. Three smaller zones in Kentucky were analyzed in greater detail regarding topography and geomorphic development because of their potential importance in subsurface exploration.

62683 **Chilean paraffin dirt. II. Natural gas seepage at an active site and its geochemical consequences.** Simoneit, B.R.T. (Univ. of California, Los Angeles); Crisp, P.T.; Rohrback, B.G.; Didyk, B.M. *Physics and Chemistry of the Earth;* **12**: 171-176(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

An active paraffin-dirt site located in the inter-Andean Plateau (altitude ~ 4300 m), Antofagasta, Chile was sampled for soil-gas and surface sediment. Soil-gases were analyzed by gas chromatography (GC), using both flame ionization and thermal conductivity detectors. Surface sediments were analyzed for their organic carbon and lipid contents and examined for bacteria. Lipids extracted from the sediments were analyzed by GC and GC-MS. High concentrations of C_1-C_6 alkanes and CO_2 were detected in the soil-gas and C_2-C_6 alkenes accumulated in the head space of canned soil. The presence of the full isomeric series of C_2-C_6 alkanes indicates the presence of an active seep; significant concentrations of methane, C_2-C_6 alkenes and CO_2 indicate microbiological activity. Microscopic examination of the soil revealed an abundance of rod bacteria. Elemental analyses yielded a high H/C ratio for the organic matter and indicated high concentrations of organic or elemental sulfur. The distribution of hydrocarbons appears typical of bacterial lipid residues. The data indicate active bacterial assimilation of seeping natural gas in contrast to the sample site studied earlier, where the seepage had ceased.

62684 **Carbon isotope effects during the pyrolytic formation of early methane from carbonaceous materials.** Chung, H.M. (Dept. of Energy, Bartlesville, OK); Sackett, W.M. *Physics and Chemistry of the Earth;* **12**: 705-710(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

The amounts and stable carbon isotope compositions of early methane formed during closed system pyrolysis of 4 coal samples of different ranks, 6 lipid-free shales of different maturities, and 1 topped crude oil were determined as a function of time. Except for 1 sample of anthracite coal, the isotopic compositions of the first methane were isotopically heavy relative to later formed methane. A carbon-12 rich peak was generally observed for a total accumulated methane to parent carbon mole ratio of about 0.01 to 0.03. These changes are discussed in terms of shifts from carbonium ion to free radical mechanisms and carbon isotope heterogeneities in the methane precursor functional groups.

62685 **Experimental evidence against an appreciable isotopic fractionation of methane during migration.** Fuex, A.N. (Shell Development Co., Houston, TX). *Physics and Chemistry of the Earth;* **12**: 725-732(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

Previously there has been much confusion regarding the magnitude and direction of the isotopic fractionation resulting from the migration of methane. Experimental results plus a mathematical simulation indicate that migration fractionation will nearly always be negligible for both the carbon and hydrogen of methane. By far the most likely cause of migration fractionation of methane is the difference in water solubility of $^{12}CH_4$ and $^{13}CH_4$. In most cases this fractionation will not exceed a negligible 1-permil depletion of ^{13}C in the methane of a commercial accumulation.

0306 Marketing And Economics

REFER ALSO TO CITATION(S) 62648, 62692, 62693, 63123, 63124, 63125, 63191

62686 (CONF-790280—, pp 243-252) **Presentation: natural gas rate form and load balancing.** Bell, D.L. Jr. (Columbia Gas Distribution Companies, Columbus, OH). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

This paper is in three sections; historical objectives of load balancing, rate design, and the effect of regulation on gas distribution companies. The view is taken that current rate regulation, evolving from historical regulation, restricts the ability of the gas utility to use its resource to the greatest economic advantage. As a result its market are eroded. The paper briefly discusses rate design with emphasis on declining block rate structure. The third part of the article highlights several regulatory decisions. Among those discussed are the Seaboard Decision and subsequent modifications of it, and incremental pricing Natural Gas Rate Form and Load Balancing arising from the National Energy Act. Finally prospects for the gas distribution industry are reviewed. (ATT)

62687 (CONF-790280—, pp 272-277) **Anatomy of industrial gas markets.** Modlin, R.A. (American Gas Association, Arlington, VA). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

The speaker discusses the industrial uses of natural gas during the seventies. Industries highlighted include: gas utilities; chemicals; all aspects of steel industry; petroleum refining; meat packing; paper products; glass; cement. Each industry's use of natural gas through the seventies is traced. (ATT)

62688 (CONF-790280—, pp 290-297) **Evaluating the demand for natural gas.** Robeson, F.E. (College of William and Mary, Williamsburg, VA). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

Determinants of natural gas demand are analyzed. The author uses demand models rather than forecasting models. The latter, while a good short run prediction of demand, may fail to capture demand determinants that the former considers. The article is in two parts: the first considers concepts of gas demand; the second offers clues as to how to integrate demand and price studies for planning, regulatory and forecasting purposes. (ATT)

62689 (CONF-790280—, pp 298-305) **Natural gas issues: critical factors, policies and effects - one industrial viewpoint.** Smith, R.A. (General Motors Corp., Detroit, MI). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

The author details General Motor's adjustment to the changing natural gas situation. Because of incremental pricing, he believes industrial use of natural gas will continue to decline. He states that natural gas price deregulation is necessary to establish market equilibrium, and stresses that only from market equilibrium, efficient allocation and conservation of natural gas will be achieved. (ATT)

62690 **(GAO/EMD—82-53) Pipeline purchases of high-cost natural gas: extent and contested issues.** (General Accounting Office, Washington, DC (USA). Energy and Minerals Div.). 6 Apr 1982. 27p. General Accounting Office, PO Box 6015, Gaithersburg, MD 20760.

Report to Senator Howard M. Metzenbaum.

Natural gas produced under certain high-cost conditions is not subject to federal price regulation. However, pipeline companies still need federal approval to pass through such costs to their customers. Pipeline company purchases of such gas have been challenged before the Federal Energy Regulatory Commission by distribution companies, state and local governments, and others. This report discusses: the extent of purchases and the prices paid for such gas by 20 major pipelines; issues raised in challenges to such purchases and company responses; and the status of major cases involving such purchases.

0308 Environmental Effects

REFER ALSO TO CITATION(S) 62673, 63100

0309 Artificial Stimulation

REFER ALSO TO CITATION(S) 62620

62691 **(DOE/BC/10249—1) Western gas sands project. Status report, January-February-March 1982.** (CER Corp., Las Vegas, NV (USA)). Sep 1982. Contract AC08-82NV10249. 104p. NTIS, PC A06/MF A01. Order Number DE83000010.

Portions of document are illegible.

During the quarter, Terra Tek, Inc. conducted spray drying tests for Bartlesville Energy Technology Center to determine the possibility of making hollow spherical proppants using a single-fluid nozzle in a counter-current air flow dryer. At Lawrence Livermore National Laboratory, a more automated data acquisition system was constructed for the PMMA apparatus, which is used to simulate a condition of one-dimensional fluid flow in a crack. At Los Alamos National Laboratory, work has progressed on utilizing the NMR T_1 relaxation data to determine the distribution of pore surface-to-volume ratios in core samples. Work this quarter continued on the thermal neutron cross section measurements in small geological samples and on analysis of the dual spaced porosity log at Sandia National Laboratory. Stimulation and production data from wells near the MWX site are being retrieved from the project data bank for use in planning future MWX operations. The stress test display and control console hardware were completed this quarter for the DOE Well Test Facility, which is now being used for the MWX experiment. At the Multi-Well site, drilling, coring, logging, casing and cementing of MWX-2 was accomplished this quarter.

0310 Legislation And Regulation

REFER ALSO TO CITATION(S) 62686, 62689, 62690, 63122, 63123, 63124, 63125, 63126

62692 (CONF-790280—, pp 278-283) **Incremental pricing required by Title II of the Natural Gas Policy Act.** Parson, D. (NICOR, Inc., Aurora, IL). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

Several issues are discussed concerning incremental pricing. These include determination of competitive ceiling price, creation of the mechanism through which incremental surcharges are passed along to eligible customers, and determination of eligibility. Alternative rate designs constitute the second topic discussed. In the analysis the author looks at costs. Costs, whether they are embedded, marginal or LRIC, are composed of three components; customer, demand, and commodity. (ATT)

62693 (CONF-790280—, pp 306-309) **End user pricing of natural gas and the Natural Gas Policy Act.** Reinbergs, M. (Madison Public Service Commission, WI). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

Natural gas pricing in Wisconsin is considered. in Wisconsin, all users will be facing marginal pricing for marginal use. During times of ample supply, industrial and residential customers are priced in block rates. Greater consumption is bought at higher prices, hence the name of marginal pricing for marginal use. Supply shortages will be met using marginal pricing as well. Customers with interruptible service will be allowed to bid beforehand on the short available supply. Those who bid highest, i.e. those with the greatest economic value, will have first claim. This will allow efficient allocation of the short supply. The highest bidders will be last cut, while lowest bidders are the first to lose service. (ATT)

0320 Transport, Pipelines, And Handling

62694 **(ERS-E—276) Microprocessor applications for the monitoring and control of gas supplies.** Davidson, R.S.; Sporton, T.M. (British Gas Corp., Newcastle-upon-Tyne). Nov 1980. 11p. NTIS, PC A02/MF A01.

From IMEKO/IFAC symposium on applications of microprocessors in devices for instrumentation and automation control; London, England (17 Nov 1980).

The potential of the microprocessor to replace many established electromechanical and pneumatic systems and to solve problems which could be tackled previously only by main-frame computers is discussed. Applications already in use and ideas under development are detailed. These include telemetry systems used for controlling and monitoring gas supplies, controlling the monitoring of a reversible liquid natural gas process for meeting peak demand on a seasonal basis, a system incorporating a microprocessor for gas holder monitoring and control, and a prototype microprocessor control system for gas distribution governors. (ESA)

62695 **(NP-tr—2904692) Effect of the statistical distribution of notched-bar impact values on the crack behavior of pipelines.** Gaessler, H.; Sawitzki, M. Translated from *Three R International ;* **10**: 550-554(Oct 1981). 14p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82904692.

Portions of document are illegible.

Because of the statistical distribution of pipes of different notched-bar impact values in the pipeline, the occurrence of long crack propagation in gas lines after initiation of an unstable crack is improbable even if several pipes do not exhibit the minimum notched-bar impact values required for crack arrest and determined from known formulae. The calculation model presented permits findings to be made on the probability of the occurrence of long-propagating cracks as a function of the cumulative frequency distribution of the impact values of the pipes supplied and the failure frequency of the pipes in the pipeline.

0340 Combustion

REFER ALSO TO CITATION(S) 62954

0350 Storage

REFER ALSO TO CITATION(S) 63100

04 OIL SHALES AND TAR SANDS

0402 Site Geology And Hydrology

REFER ALSO TO CITATION(S) 62667

62696 **(METC/EGSP—500) Rome Trough section: a stratigraphic section through the Devonian-Mississippian black-shale sequence in Tennessee, Kentucky, and West Virginia.** Wilson, E.N.; Zafar, J.S.; Ettensohn, F.R. (Kentucky Geological Survey, Lexington (USA). Dept. of Geology; Kentucky Univ., Lexington (USA). Research Foundation). 1981. Contract AC21-76MC05202. 40p. NTIS, PC A03/MF A01. Order Number DE82021969.

62697 **Geochemical study of the organic matter in outcrop samples from Agardhfjellet, Spitsbergen.** Bjoroey, M.; Vigran, J.O. (Continental Shelf Inst., Trondheim, Norway). *Physics and Chemistry of the Earth;* **12**: 141-147(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

An organic geochemical study of a homogeneous shale sequence of Mesozoic age at Agardhfjellet, Spitsbergen, in the Svalbard archipelago is reported. Analyses on the soluble extracts were undertaken together with visual kerogen and vitrinite reflectance

analyses to estimate the maturity of the organic matter. The sequence is found to be in the Oil Window. Rock-Eval pyrolysis indicated that most of the Cretaceous samples contain type III kerogen, whereas the Jurassic samples contain mainly type II kerogen. A high production index for hydrocarbons was found for most of the samples. The variation in quantity and quality of the soluble extracts, with respect to changes in maturity, is discussed together with the effect that weathering might have had on some of the results.

0403 Drilling, Fracturing, And Mining

62698 **(DOE/CS/15006—T1-Vol.1) Haspert oil-shale mining systems. Final report on design work of a prototype oil-shale mining machine.** Haspert, J.C. (Underground Systems, Arcadia, CA (USA)). 1981. Contract FG01-80CS15006. 154p. NTIS, PC A08/MF A01. Order Number DE81025760.

Portions of document are illegible.

In this underground mining system, a heading surface sloping upward from the horizontal at 40° and a rectangular shaped opening are used. The drilling tools oscillate linearly up and down a sloped heading area. This volume treats the purpose and objectives of a pilot machine, mechanical techniques, and approach to the required functions. 21 figures. (DLC)

62699 **(DOE/CS/15006—T1-Vol.2) Haspert oil-shale mining system. Final report on design work of a prototype oil shale mining machine.** Haspert, J.C. (Underground Systems, Arcadia, CA (USA)). 1981. Contract FG01-80CS15006. 210p. NTIS (US Sales Only). Order Number DE81026351.

Portions of document are illegible.

This volume treats the complete preliminary design of the pilot machine, and the pertinent, unique hardware requirements; presents a drawing data log (reduced copies of pertinent design drawings); and presents a nomenclature, a numerical drawing designation index, estimated weights, and anticipated machine operation procedure.

0404 Oil Production, Recovery, And Refining

REFER ALSO TO CITATION(S) 62684

0405 Properties And Composition

REFER ALSO TO CITATION(S) 63210

62700 **(DOE/LC/10446—T1) Laboratory evaluation of selected syncrude products and upgraded by-products as pavement-recycling agents.** Holmgreen, R.J. Jr.; Epps, J.A.; Button, J.W.; Cook, O.C. (Texas A and M Univ., College Station (USA). Texas Transportation Inst.). 1982. Contract AS20-80LC10446. 121p. NTIS, PC A06/MF A01. Order Number DE82021250.

Portions of document are illegible.

The following conclusions appear warranted based on the information derived from this study: (1) Selected syncrude products and upgraded by-products may be successfully used as recycling agents for field aged asphalt pavements. Those tested in this study performed equally as well as the commercially produced recycling agents. (2) Several of the blends containing the syncrude recycling agents exhibited excessive hardening and weight loss upon exposure to the thin film oven test. (3) Properties of recycled mixtures are highly dependent upon the type and amount of recycling agent. (4) The Rostler-Sternberg separation analysis on both the syncrudes and syncrude blends does not seem to produce results that correlate with other recycling agents. (5) Rostler-Sternberg analysis indicated a relatively high fraction of nitrogen bases in the syncrude additives, particularly those from shale oil. Although basic nitrogen in asphalts has been associated with improved resistance to moisture, recycled mixtures containing these materials did not exhibit any significant improvement in resistance to damage by water. Recycled mixtures containing recycling agent 4 (a soft tar sand asphalt) imparted excellent flexibility and yet adequate strength to paving mixtures at low service temperatures. (7) All of the blends containing the syncrude-based recycling agents, except California Coastal with recycling agent 3 (Tar Sand Asphalt and Stabilized Shale Oil), met criteria set forth by Halstead and Krchma for acceptable field performance. (8) The syncrude-based recycling agents produced blends with Rostler parameters and N/P values nearer those of the original asphalts than the commercial recycling agents. (9) According to Rostler-Sternberg analyses, none of the recycling agents were able to restore a base asphalt to its original composition, but this was not and should be not expected. 33 figures, 21 tables.

62701 **New analytical approaches to organic geochemistry: solid phase functional group extraction for bitumens and functional group markers for kerogens.** Costa Neto, C.; Macaira, A.M.P.; Pinto, R.C.P.; Nakayama, H.T.; Cardoso, J.N. (Univ. Federal do Rio de Janeiro, Brazil). *Physics and Chemistry of the Earth;* **12**: 249-263(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

The first step of a general strategy for the analysis of bitumens and kerogens is based on specific functional group reactions carried out on solid surfaces: for soluble materials (bitumens, tars, etc.) a fractionation of the sample into isofunctional sets of compounds was accomplished by means of the Solid Phase Functional Group Extraction technique. This paper describes the use of the functional reagents diphenylenediamine and carboxyhydrazide bound to a solid (polymer) matrix for the selective isolation of aldehydes and ketones, respectively. The individual compounds were further separated and identified by combined gas chromatography-mass spectrometry. Functional groups of insoluble materials (kerogens) were determined through reactions of specific functional reagents (containing a marker) directly with the solid surface of the kerogen. In this paper, bromine or chlorine were chosen as markers, and the reagents p-bromophenacylbromide, p-chloroaniline, p-chlorobenzenediazonium sulphate, p-chlorobenzaldehyde, N-bromosuccinimide, p-bromobenzoyl chloride, N,N-di(p-bromophenyl)ethylenediamine, and p-bromobenzhydrazide, were used for the determination of the groups carboxylic acid, aldehyde, phenol/aromatic amines, primary amines, allylic/hydrogen, alcohols/primary-secondary amines, aldehydes and carbonyl compounds, respectively. Results are discussed for Brazilian oil shales from the Irati, Tremembe and Marau Formations.

62702 **Molecular fossils of Archaebacteria as selective degradation products of kerogen.** Chappe, B.; Michaelis, W.; Albrecht, P. (Univ. Louis Pasteur, Strasbourg, France). *Physics and Chemistry of the Earth;* **12**: 265-274(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

A mixture of alkanes is obtained by treatment of the kerogen from the lacustrine Messel oil shale (Eocene) with boron tribromide, followed by the reduction of the released bromides with lithium aluminum hydride (or deuteride). The n-alkanes (C_{25}-C_{34}) show a high even predominance. They correspond to long-chain diols from higher plants, which are linked to the kerogen as diethers or diesters. The branched and cyclic alkanes show a relatively simple pattern, between C_{15} and C_{40}, corresponding to long-chain, slightly branched and isoprenoid hydrocarbons. Anteisopentadecane, $C_{15}H_{32}$, 8, isopentadecane, $C_{15}H_{32}$, 7, and its dimer, 13,16-dimethyloctacosane, $C_{30}H_{62}$, 9, as well as phytane, $C_{20}H_{42}$, 5, its dimer, bisphytanyl, $C_{40}H_{82}$, 2 and another isoprenoid compound, $C_{40}H_{80}$, 3, with 1 5-membered ring, have been identified as major components by comparison with standards. The C_{15} and C_{30} compounds are attached to the kerogen as alcohols and diols implied in ether or ester linkages. The structural identity of the C_{20} and C_{40} compounds with those obtained recently by a similar sequence from Archaebacteria, clearly suggests that molecular entities of these micro-organisms, especially of methanogens, are incorporated in the kerogen as mono- and α,ω-diethers. It could also mean that the cell membranes of these bacteria are an integral part of the kerogen.

62703 **Analytical approaches to the investigation of kerogen structure by mass spectrometric techniques.** Brown, S.; Baillie, T.A.; Burlingame, A.L. (Univ. of California, Berkeley). *Physics and Chemistry of the Earth;* **12**: 475-484(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

Specific chemical degradation techniques have been developed to liberate structural elements from Green River Formation oil shale kerogen and from protokerogens derived from recent algal mats at Baffin Bay, Texas (USA). These degradation techniques include saponification, reduction by the novel complex hydride, sodium bis-(2 methoxy ethoxy) aluminum hydride (SMEAH) and treatment with trimethylsilyl iodide (TMSI). Saponification of the algal mats demonstrated significant changes in the composition of the protokerogen structure over the past 1000 years.

62704 **Preliminary organic geochemical investigation of the Kimmeridgian oil shales.** Williams, P.F.V.; Douglas, A.G. (Newcastle upon Tyne Univ., England). *Physics and Chemistry of the Earth;* **12**: 531-545(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

The Kimmeridge oil shales have assumed renewed significance because of their role as the prime source-rock for North Sea oil, and because of the need to assess their potential as a possible future supply of shale oil. This paper presents the results of a preliminary investigation of selected Kimmeridge oil shales. The immature shales are rich in organic matter with a dominantly marine type II kerogen showing evidence of algal contributions and a general sparsity of land-derived, higher plant detritus. Column chromatographic and capillary column gas chromatographic examinations of bitumens, pyrolysates and pyrolysis gas chromatograms of kerogen isolates show a predominance of aromatics in the hydrocarbon fractions, with bitumen n-alkane gas chromatograms showing evidence of algal-derived organic matter with n-alkane maxima in the n-C_{17} region. Possible contributions from lower land plants are indicated by a second n-alkane maximum at n-C_{23}, whilst higher land plant detritus makes only a limited contribution. Reflected light microscopic examination of the shales also shows a general sparsity of recognizable land-derived woody or herbaceous material. Shale oil compositions reflect their pyrolytic origin, with unsaturates forming a large part of the aliphatic hydrocarbon fraction, together with significant amounts of isoprenoid alkanes; organic sulphur compounds are also prominent in the hydrocarbon fractions. Finally, considerable amounts of sterane and pentacyclic triterpane hydrocarbons have been found in the bitumen aliphatic hydrocarbon fractions, their distributions allowing Blackstone samples to be differentiated from those of lower stratigraphic levels.

62705 **Polar constituents isolated from Aleksinac oil shale.** Saban, M. (Univ. of Beograd, Yugoslavia); Porter, S.; Costello, C.; Djuricic, M.; Vitorovic, D. *Physics and Chemistry of the Earth;* **12**: 559-566(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

Continuing an investigation of the composition of bitumen from Aleksinac (Yugoslavia) shale, we report here in the bitumen extracted with benzene the following compounds: aromatic hydrocarbons, C/sub n/H/sub 2n-14/ (biphenyls) and C/sub n/H/sub 2n-18/ (anthracenes and/or phenanthrenes), oxygen compounds C/sub n/H/sub 2n/O_2 (methyl esters of fatty acids), C/sub n/H/sub 2n/O (aliphatic methyl ketones), and the triterpenoid ketone adiantone. The presence of these compounds in the bitumen is due to diagenetic changes of precursor biological material; adiantone alone presumably represents an intact residue of Miocene ferns.

62706 **Kerogen structural studies: oxidations with alkaline permanganate and with ferric chloride.** Vitorovic, D.; Krsmanovic, V.D.; Pfendt, P.A. (Univ. of Beograd, Yugoslavia). *Physics and Chemistry of the Earth;* **12**: 585-589(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

Two oxidizing agents were used for structural studies of the kerogen from Aleksinac shale (Yugoslavia), namely: (1) alkaline potassium permanganate, and (2) acidic ferric chloride. The main goal with alkaline permanganate was to obtain optimum yields of identifiable oxidation products with preserved kerogen structural characteristics. In order to find optimal conditions, experiments were carried out at various temperatures (20 to 100°C) with varying amounts of permanganate per step. The best total yield of isolable degradation products (92.25%) was obtained at 75°C. At the same reaction temperature the best yield of ether-soluble acids was obtained (39% of the total organic matter). Kerogen degradation products obtained in high yields provide a better basis for more reliable structural interpretations than the products obtained in minor yields, which may represent small undefined portions of the original kerogen. Ferric chloride is an oxidant of relatively high oxidation potential, although it is more gentle and more specific (e.g., dehydrogenation and decarboxylation) than most oxidation reagents containing oxygen used in kerogen structural studies. In oxidation of the Aleksinac shale kerogen concentrate with acidic ferric chloride solution the pyrite content decreased (38 to 75%), and the kerogen content increased (7 to 15%). A small portion of the kerogen (~ 8%) was degraded into soluble products. The chemical nature of the kerogen was considerably changed. In addition to a decrease in the atomic H/C ratio and an increase in the O/C ratio, changes in the content of aliphatic, aromatic, carbonyl and quinoid structures were observed.

0406 Direct Uses And By-products

REFER ALSO TO CITATION(S) 62700

05 NUCLEAR FUELS

62707 **(NEANDC(J)—79/U) Survey of nuclear data requirements through the uranium-plutonium fuel cycle.** Umezawa, H.; Hisatake, K. (eds.). (Japan Atomic Energy Research Inst., Tokyo). 1982. 89p. (INDC(JAP)—66/L; JAERI-M—9993). Information Section, Division of Technical Information, Japan Atomic Energy Research Institute, Tokai-mura, Naka-gun, Ibaraki-ken 319-11, Japan.

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Since 1978, a working group has been set in JNDC and made a survey of the potential needs on nuclear data over the uranium-plutonium fuel cycle which has been developed in Japan. Current status on the uses of nuclear data are reviewed in the various areas: mining and milling, enrichment, fabrication of uranium and plutonium fuels, spent fuel reprocessing, transportation of nuclear material, radiation shielding, environmental safety, actinides incineration study, reactor dosimetry, and safeguards of nuclear material. A wide variety of data was required, which were classified in terms of decay data, cross sections and fission-product yields. The need of covariance file with the evaluated cross section data was recognized. Furthermore, users in the various areas were in need of reasonable data sets connecting with some computer codes which could predict the amounts of actinides and fission products in the irradiated LWR fuels. The requirements are summarized and desirable actions for those are recommended.

0501 Reserves

62708 **Interaction of uranium and organic matter in unaniferous sediments.** Rouzaud, J.N.; Oberlin, A.; Trichet, J. (Univ. d'Orleans, France). *Physics and Chemistry of the Earth;* **12**: 505-516(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

Conventional transmission electron microscopy (lattice fringes and dark field techniques) was used for determining the structure and microtexture of some Precambrian organic matter. The samples came from Cluff (Saskatchewan, Canada) and Oklo (Gabon) and contain uranium with organo-metallic bonding (uranium was shown to be present by energy dispersive X-ray analysis carried out in the CTEM). Despite their algal origin, these materials show a high oxygen content. This strong degree of oxidation inhibits the parallel molecular orientation usually produced in carbonaceous products as coalification progresses. Progressive heat-

treatment to 3000°C produces microporous carbon (50 to 100A). It is, however, partially transformed into graphite in a manner similar to anthracites and non-graphitizable carbons heat-treated under pressure (5 kbars). It is favored by pore flattening, due to pressure, which introduces a long-range, preferred orientation parallel to the flattening plane. Conversely, it is partially prevented by cross-linking due to oxygen. Comparison with materials of higher plant origin (e.g. from Arlit, Niger) suggests a possible mechanism of uranium fixation.

0502 Exploration

62709 **(GJBX—124-82) Uranium hydrogeochemical and stream-sediment reconnaissance of the Teller NTMS Quadrangle, Alaska. National Uranium Resource Evaluation.** (Bendix Field Engineering Corp., Grand Junction, CO (USA); Los Alamos National Lab., NM (USA)). Jun 1982. Contract AC13-76GJ01664;W-7405-ENG-36. 85p. NTIS (US Sales Only). Order Number DE82020449.

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This report presents results of a Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) of the Teller NTMS quadrangle, Alaska. In addition to this abbreviated data release, more complete data are available to the public in machine-readable form. These machine-readable data, as well as quarterly or semiannual program progress reports containing further information on the HSSR program in general, or on the Los Alamos National Laboratory (LANL) portion of the program in particular, are available from DOE's Technical Library at its Grand Junction Area Office. Presented in this data release are location data, field analyses, and laboratory analyses of several different sample media. For the sake of brevity, many field site observations have not been included in this volume; these data are, however, available on the magnetic tape. Appendices A through D describe the sample media and summarize the analytical results for each medium. The data have been subdivided by one of the Los Alamos National Laboratory sorting programs of Zinkl and others (1981a) into groups of stream-sediment, lake-sediment, stream-water, lake-water, and ground-water samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements have been included in this report. Also included are maps showing results of multivariate statistical analyses. Information on the field and analytical procedures used by the Los Alamos National Laboratory during sample collection and analysis may be found in any HSSR data release prepared by the Laboratory and will not be included in this report.

62710 **(GJBX—179-82) Uranium hydrogeochemical and stream-sediment reconnaissance of the Kotzebue NTMS Quadrangle, Alaska. National Uranium Resource Evaluation.** (Bendix Field Engineering Corp., Grand Junction, CO (USA); Los Alamos National Lab., NM (USA)). Aug 1982. Contract AC13-76GJ01664. 51p. NTIS (US Sales Only). Order Number DE82021667.

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This report presents results of a Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) of the Kotzebue NTMS quadrangle, Alaska. In addition to this abbreviated data release, more complete data are available to the public in machine-readable form. These machine-readable data, as well as quarterly or semiannual program progress reports containing further information on the HSSR program in general, or on the Los Alamos National Laboratory (LANL) portion of the program in particular, are available from DOE's Technical Library at its Grand Junction Area Office. Presented in this data release are location data, field analyses, and laboratory analyses of several different sample media. For the sake of brevity, many field site observations have not been included in this volume; these data are, however, available on the magnetic tape. Appendices A through D describe the sample media and summarize the analytical results for each medium. The data have been subdivided by one of the Los Alamos National Laboratory sorting programs of Zinkl and others (1981a) into groups of stream-sediment, lake-sediment, stream-water, and lake-water samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements have been included in this report. Also included are maps showing results of multivariate statistical analyses. Information on the field and analytical procedures used by the Los Alamos National Laboratory during sample collection and analysis may be found in any HSSR data release prepared by the Laboratory and will not be included in this report. 9 figures, 7 tables.

62711 **(GJBX—180-82) Uranium hydrogeochemical and stream-sediment reconnaissance of the Noatak NTMS Quadrangle, Alaska. National Uranium Resource Evaluation.** (Bendix Field Engineering Corp., Grand Junction, CO (USA); Los Alamos National Lab., NM (USA)). Aug 1982. Contract AC13-76GJ01664. 93p. NTIS (US Sales Only). Order Number DE82021666.

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This report presents results of a Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) of the Noatak NTMS quadrangle, Alaska. In addition to this abbreviated data release, more complete data are available to the public in machine-readable form. These machine-readable data, as well as quarterly or semiannual program progress reports containing further information on the HSSR program in general, or on the Los Alamos National Laboratory (LANL) portion of the program in particular, are available from DOE's Technical Library at its Grand Junction Area Office. Presented in this data release are location data, field analyses, and laboratory analyses of several different sample media. For the sake of brevity, many field site observations have not been included in this volume; these data are, however, available on the magnetic tape. Appendices A through D describe the sample media and summarize the analytical results for each medium. The data have been subdivided by one of the Los Alamos National Laboratory sorting programs of Zinkl and others (1981a) into groups of stream-sediment, lake-sediment, stream-water, and lake-water samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements have been included in this report. Also included are maps showing results of multivariate statistical analyses. Information on the field and analytical procedures used by the Los Alamos National Laboratory during sample collection and analysis may be found in any HSSR data release prepared by the Laboratory and will not be included in this report. 16 figures, 12 tables.

62712 **(GJBX—181-82) Uranium hydrogeochemical and stream-sediment reconnaissance of the Ophir NTMS Quadrangle, Alaska. National Uranium Resource Evaluation.** Zinkl, R.J.; Hardy, L.C.; D'Andrea, R.F. Jr. (comps.). (Bendix Field Engineering Corp., Grand Junction, CO (USA); Los Alamos National Lab., NM (USA)). Aug 1982. Contract AC13-76GJ01664. 99p. NTIS (US Sales Only). Order Number DE82021665.

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This report presents results of a Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) of the Ophir NTMS quadrangle, Alaska. In addition to this abbreviated data release, more complete data are available to the public in machine-readable form. These machine-readable data, as well as quarterly or semiannual program progress reports containing further information on the HSSR program in general, or on the Los Alamos National Laboratory (LANL) portion of the program in particular, are available from DOE's Technical Library at its Grand Junction Area Office. Presented in this data release are location data, field analyses, and laboratory analyses of several different sample media. For the sake of brevity, many field site observations have not been included in this volume; these data are, however, available on the magnetic tape. Appendices A and B describe the sample media and summarize the analytical results for each medium. The data have been subdivided by one of the Los Alamos National Laboratory sorting programs of Zinkl and others (1981a) into groups of stream-sediment and lake-sediment samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements have been included in this report. Also included are maps showing results of multivariate statistical analyses. Information on the field and analytical procedures used by the Los Alamos National Laboratory during sample collection and analysis may be found in any HSSR data release prepared by the Laboratory and will not be included in this report. 14 figures, 10 tables.

62713 **(GJBX—182-82) Uranium hydrogeochemical and stream sediment reconnaissance of the Kateel River NTMS Quadrangle, Alaska. National Uranium Resource Evaluation.** Hardy, L.C.; D'Andrea, R.F. Jr.; Zinkl, R.J. (comps.). (Bendix Field Engineering Corp., Grand Junction, CO (USA); Los Alamos National Lab., NM (USA)). Aug 1982. Contract AC13-76GJ01664. 94p. NTIS (US Sales Only). Order Number DE82022477.

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This report presents results of a Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) of the Kateel River NTMS Quadrangle, Alaska. In addition to this abbreviated data release, more complete data are available to the public in machine-readable form. These machine-readable data, as well as quarterly or semiannual program progress reports containing further information on the HSSR program in general, or on the Los Alamos National Laboratory (LANL) portion of the program in particular, are available from DOE's Technical Library at its Grand Junction Area Office. Presented in this data release are location data, field analyses, and laboratory analyses of several different sample media. For the sake of brevity, many field site observations have not been included in this volume; these data are, however, available on the magnetic tape. Appendices A and B describe the sample media and summarize the analytical results for each medium. The data have been subdivided by one of the Los Alamos National Laboratory sorting programs of Zinkl and others (1981a) into groups of stream-sediment, lake-sediment, stream-water, lake-water, and ground-water samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements have been included in this report. Also included are maps showing results of multivariate statistical analyses. Information on the field and analytical procedures used by the Los Alamos National Laboratory during sample collection and analysis may be found in any HSSR data release prepared by the Laboratory and will not be included in this report.

62714 **(GJBX—183-82) Uranium hydrogeochemical and stream sediment reconnaissance of the Melozitna NTMS quadrangle, Alaska. National Uranium Resource Evaluation.** D'Andrea, R.F. Jr.; Zinkl, R.J.; Hardy, L.C. (Bendix Field Engineering Corp., Grand Junction, CO (USA); Los Alamos National Lab., NM (USA)). Aug 1982. Contract AC13-76GJ01664. 96p. NTIS (US Sales Only). Order Number DE82022504.

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This report presents results of a Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) of the Melozitna NTMS quadrangle, Alaska. In addition to this abbreviated data release, more complete data are available to the public in machine-readable form. These machine-readable data, as well as quarterly or semiannual program progress reports containing further information on the HSSR program in general, or on the Los Alamos National Laboratory (LANL) portion of the program in particular, are available from DOE's Technical Library at its Grand Junction Area Office. Presented in this data release are location data, field analyses, and laboratory analyses of several different sample media. For the sake of brevity, many field site observations have not been included in this volume; these data are, however, available on the magnetic tape. Appendices A and B describe the sample media and summarize the analytical results for each medium. The data have been subdivided by one of the Los Alamos National Laboratory sorting programs of Zinkl and others (1981a) into groups of stream-sediment, lake-sediment, stream-water, lake-water, and ground-water samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements have been included in this report. Also included are maps showing results of multivariate statistical analyses. Information on the field and analytical procedures used by the Los Alamos National Laboratory during sample collection and analysis may be found in any HSSR data release prepared by the Laboratory and will not be included in this report.

62715 **(GJBX—184-82) Uranium hydrogeochemical and stream sediment reconnaissance of the Clovis NTMS Quadrangle, New Mexico. National Uranium Resource Evaluation.** Zinkl, R.J.; Hardy, L.C.; D'Andrea, R.F. Jr. (comps.). (Bendix Field Engineering Corp., Grand Junction, CO (USA); Los Alamos National Lab., NM (USA)). Aug 1982. Contract AC13-76GJ01664. 95p. NTIS (US Sales Only). Order Number DE82022478.

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This report presents results of a Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) of the Clovis NTMS Quadrangle, New Mexico. In addition to this abbreviated data release, more complete data are available to the public in machine-readable form. These machine-readable data, as well as quarterly or semiannual program progress reports containing further information on the HSSR program in general, or on the Los Alamos National Laboratory (LANL) portion of the program in particular, are available from DOE's Technical Library at its Grand Junction Area Office. Presented in this data release are location data, field analyses, and laboratory analyses of several different sample media. For the sake of brevity, many field site observations have not been included in this volume; these data are, however, available on the magnetic tape. Appendices A through E describe the sample media and summarize the analytical results for each medium. The data have been subdivided by one of the Los Alamos National Laboratory sorting programs of Zinkl and others (1981a) into groups of stream-sediment, lake-sediment, stream-water, lake-water, and ground-water samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements have been included in this report. Also included are maps showing results of multivariate statistical analyses.Information on the field and analytical procedures used by the Los Alamos National Laboratory during sample collection and analysis may be found in any HSSR data release prepared by the Laboratory and will not be included in this report.

62716 **(GJBX—185-82) Uranium hydrogeochemical and stream sediment reconnaissance of the Iditarod NTMS Quadrangle, Alaska. National Uranium Resource Evaluation.** Hardy, L.C.; D'Andrea, R.F. Jr.; Zinkl, R.J. (comps.). (Bendix Field Engineering Corp., Grand Junction, CO (USA); Los Alamos National Lab., NM (USA)). Aug 1982. Contract AC13-76GJ01664. 161p. NTIS (US Sales Only). Order Number DE82022479.

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This report presents results of a Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) of the Iditarod NTMS Quadrangle, Alaska. In addition to this abbreviated data release, more complete data are available to the public in machine-readable form. These machine-readable data, as well as quarterly or semiannual program progress reports containing further information on the HSSR program in general, or on the Los Alamos National Laboratory (LANL) portion of the program in particular, are available from DOE's Technical Library at its Grand Junction Area Office. Presented in this data release are location data, field analyses, and laboratory analyses of several different sample media. For the sake of brevity, many field site observations have not been included in this volume; these data are, however, available on the magnetic tape. Appendices A and B describe the sample media and summarize the analytical results for each medium. The data have been subdivided by one of the Los Alamos National Laboratory sorting programs of Zinkl and others (1981a) into groups of stream-sediment, lake-sediment, stream-water, lake-water, and ground-water samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps pertinent elements have been included in this report. Also included are maps showing results of multivariate statistical analyses.Information on the field and analytical procedures used by the Los Alamos National Laboratory during sample collection and analysis may be found in any HSSR data release prepared by the Laboratory and will not be included in this report.

62717 **(GJBX—186-82) Uranium hydrogeochemical and stream sediment reconnaissance of the Circle NTMS quadrangle, Alaska. National Uranium Resource Evaluation.** D'Andrea, R.F. Jr.; Zinkl, R.J.; Hardy, L.C. (Bendix Field Engineering Corp., Grand Junction, CO (USA); Los Alamos National Lab., NM (USA)). Aug 1982. Contract AC13-76GJ01664. 147p. NTIS (US Sales Only). Order Number DE82022480.

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This report presents results of a Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) of the Circle NTMS quadrangle, Alaska. In addition to this abbreviated data release, more complete data are available to the public in machine-readable form. These machine-readable data, as well as quarterly or semiannual program progress reports containing further information on the HSSR program in general, or on the Los Alamos National Laboratory (LANL) portion of the program in particular are available from DOE's Technical Library at its Grand Junction Area Office. Presented in this data release are location data, field analyses, and laboratory analyses of several different sample media. For the sake of brevity, many field site observations have not been included in this volume; these data are, however, available on the magnetic tape. Appendices A and B describe the sample media and summarize the analytical results for each medium. The data have been subdivided by one of the Los Alamos National Laboratory sorting programs of Zinkl and others (1981a) into groups of stream-sediment and lake-sediment samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements have been included in this report. Also included are maps showing results of multivariate statistical analyses. Information on the field and analytical procedures used by the Los Alamos National Laboratory during sample collection and analysis may be found in any HSSR data release prepared by the Laboratory and will not be included in this report.

62718 **(GJBX—187-82) Uranium hydrogeochemical and stream sediment reconnaissance of the Craig NTMS Quadrangle, Alaska. National Uranium Resource Evaluation.** Zinkl, R.J.; Hardy, L.C.; D'Andrea, R.F. Jr. (comps.). (Bendix Field Engineering Corp., Grand Junction, CO (USA); Los Alamos National Lab., NM (USA)). Aug 1982. Contract AC13-76GJ01664. 36p. NTIS (US Sales Only). Order Number DE82022481.

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This report presents results of a Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) of the Craig NTMS Quadrangle, Alaska. In addition to this abbreviated data release, more complete data are available to the public in machine-readable form. These machine-readable data, as well as quarterly or semiannual program progress reports containing further information on the HSSR program in general, or on the Los Alamos National Laboratory (LANL) portion of the program in particular, are available from DOE's Technical Library at its Grand Junction Area Office. Presented in this data release are location data, field analyses, and laboratory analyses of several different sample media. For the sake of brevity, many field site observations have not been included in this volume; these data are, however, available on the magnetic tape. Appendices A and B describe the sample media and summarize the analytical results for each medium. The data have been subdivided by one of the Los Alamos National Laboratory sorting programs of Zinkl and others (1981a) into groups of stream-sediment and lake-sediment samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements have been included in this report. Also included are maps showing results of multivariate statistical analyses. Information on the field and analytical procedures used by the Los Alamos National Laboratory during sample collection and analysis may be found in any HSSR data release prepared by the Laboratory and will not be included in this report.

62719 **(GJBX—188-82) Uranium hydrogeochemical and stream-sediment reconnaissance of the Kantishna River NTMS quadrangle, Alaska. National Uranium Resource Evaluation.** Hardy, L.C.; D'Andrea, R.F. Jr.; Zinkl, R.J. (comps.). (Bendix Field Engineering Corp., Grand Junction, CO (USA); Los Alamos National Lab., NM (USA)). Aug 1982. Contract AC13-76GJ01664. 81p. NTIS (US Sales Only). Order Number DE82022482.

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This report presents results of a Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) of the Kantishna River NTMS quadrangle, Alaska. In addition to this abbreviated data release, more complete data are available to the public in machine-readable form. These machine-readable data, as well as quarterly or semiannual program progress reports containing further information on the HSSR program in general, or on the Los Alamos National Laboratory (LANL) portion of the program in particular, are available from DOE's Technical Library at its Grand Junction Area Office. Presented in this data release are location data, field analyses, and laboratory analyses of several different sample media. For the sake of brevity, many field site observations have not been included in this volume; these data are, however, available on the magnetic tape. Appendices A and B describe the sample media and summarize the analytical results for each medium. The data have been subdivided by one of the Los Alamos National Laboratory sorting programs of Zinkl and others (1981a) into groups of stream-sediment and lake-sediment samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements have been included in this report. Also included are maps showing results of multivariate statistical analyses. Information on the field and analytical procedures used by the Los Alamos National Laboratory during sample collection and analysis may be found in any HSSR data release prepared by the Laboratory and will not be included in this report.

62720 **(GJBX—189-82) Uranium hydrogeochemical and stream-sediment reconnaissance of the Eagle NTMS quadrangle, Alaska. National Uranium Resource Evaluation.** D'Andrea, R.F. Jr.; Zinkl, R.J.; Hardy, L.C. (comps.). (Bendix Field Engineering Corp., Grand Junction, CO (USA); Los Alamos National Lab., NM (USA)). Aug 1982. Contract AC13-76GJ01664. 148p. NTIS (US Sales Only). Order Number DE82022483.

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This report presents results of a Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) of the Eagle NTMS quadrangle, Alaska. In addition to this abbreviated data release, more complete data are available to the public in machine-readable form. These machine-readable data, as well as quarterly or semiannual program progress reports containing further information on the HSSR program in general, or on the Los Alamos National Laboratory (LANL) portion of the program in particular, are available from DOE's Technical Library at its Grand Junction Area Office. Presented in this data release are location data, field analyses, and laboratory analyses of several different sample media. For the sake of brevity, many field site observations have not been included in this volume; these data are, however, available on the magnetic tape. Appendices A and B describe the sample media and summarize the analytical results for each medium. The data have been subdivided by one of the Los Alamos National Laboratory sorting programs of Zinkl and others (1981a) into groups of stream-sediment and lake-sediment stream-water, lake-water, and ground-water samples. For each group which contains a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements have been included in this report. Also included are maps showing results of multivariate statistical analyses. Information on the field and analytical procedures used by the Los Alamos National Laboratory during sample collection and analysis may be found in any HSSR data release prepared by the Laboratory and will not be included in this report.

62721 (GJBX—210-82) Orientation study of the Chattanooga Shale Area, Soddy-Daisy, Tennessee. National Uranium Resource Evaluation program. Sargent, K.A. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Aug 1982. Contract AC09-76SR00001. 42p. (DPST—81-141-34). NTIS, PC A03/MF A01. Order Number DE82021073.

An orientation study was conducted in the Soddy-Daisy area, Tennessee, in preparation for a hydrogeochemical and stream sediment reconnaissance in the Cumberland Plateau and the Valley and Ridge Provinces. The area was chosen because of the excellent exposure of the Chattanooga Shale. The study was carried out by the Savannah River Laboratory as part of the National Uranium Resource Evaluation (NURE). A total of 40 ground water, 36 surface water, and 88 sediment samples were obtained. The concentrations of uranium and other elements were determined by neutron activation analysis. This report is issued in draft form, without detailed technical and copy editing. This was done to make the report available to the public before the end of the NURE program. 4 figures, 6 tables.

62722 (GJBX—211-82) Evaluation of uranium geochemical anomalies in the Greenville 1° x 2° Quadrangle (Avalon, Greer, Honea, and Northeast Greenville). National Uranium Resource Evaluation program. Sargent, K.A.; Price, V. Jr. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Aug 1982. Contract AC09-76SR00001. 54p. (DPST—81-141-39). NTIS, PC A04/MF A01. Order Number DE82021072.

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The Savannah River Laboratory (SRL) was involved in the National Uranium Resource Evaluation (NURE) from 1974 through 1981. The SRL role was to design, conduct, and report the data from a geochemical reconnaissance of almost half the continental United States. The purpose of this work was to provide a basis for evaluating the uranium potential of areas and to identify areas meriting conventional geologic followup. More than 275,000 samples of stream sediment, soil, vegetation, and ground or surface water were collected in the program. As a part of the development program to support interpretation of the geochemical data, SRL conducted a series of field studies to verify anomalies that were identified from reconnaissance data. Subcontractors were selected to conduct field scintillometer surveys, compile geologic maps, collect additional samples, or provide other services needed for a given study. This report summarizes the results of four small studies that were conducted for SRL by V.S. Griffin, Jr., in the Greenville 1° x 2° quadrangle. Normal editing was not done so the report could be released to the public before the termination of the NURE program. Thus, conceptual errors that may be present have not been corrected, and the reader is cautioned to use professional judgment in interpreting the data. These studies include original geologic maps and the results of field radioactivity measurements. 20 figures, 5 tables.

62723 (GJBX—213-82) Geology and mineral resources of the Los Angeles, Needles, Salton Sea, San Bernardino, and Trona 1° x 2° NTMS quadrangles. National Uranium Resource Evaluation Program. Karfunkel, B.S. (comp.). (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Aug 1982. Contract AC09-76SR00001. 207p. NTIS (US Sales Only). Order Number DE83000780.

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This document provides a summary of the geology and mineral resources for the Los Angeles, Needles, Salton Sea, San Bernardino, and Trona 1° x 2° quadrangles of the National Topographic Map Series. Savannah River Laboratory has issued hydrogeochemical and stream sediment reconnaissance reports for all but the Los Angeles quadrangle. The report is issued in draft form, without detailed technical and copy editing. This was done to make the report available to the public before the end of the National Uranium Resource Evaluation.

62724 (PGJ/F—001-82) National Uranium Resource Evaluation: Marfa Quadrangle, Texas. Henry, C.D.; Duex, T.W.; Wilbert, W.P. (Texas Univ., Austin (USA). Bureau of Economic Geology; Bendix Field Engineering Corp., Grand Junction, CO (USA)). Sep 1982. Contract AC13-76GJ01664. 95p. NTIS PCE07/MF $6.50. Order Number DE82021096.

Includes 11 sheets of 24x reduction microfiche.

The uranium favorability of the Marfa 1° by 2° Quadrangle, Texas, was evaluated in accordance with criteria established for the National Uranium Resource Evaluation. Surface and subsurface studies, to a 1500 m (5000 ft) depth, and chemical, petrologic, hydrogeochemical, and airborne radiometric data were employed. The entire quadrangle is in the Basin and Range Province and is characterized by Tertiary silicic volcanic rocks overlying mainly Cretaceous carbonate rocks and sandstones. Strand-plain sandstones of the Upper Cretaceous San Carlos Formation and El Picacho Formation possess many favorable characteristics and are tentatively judged as favorable for sandstone-type deposits. The Tertiary Buckshot Ignimbrite contains uranium mineralization at the Mammoth Mine. This deposit may be an example of the hydroauthigenic class; alternatively, it may have formed by reduction of uranium-bearing ground water produced during diagenesis of tuffaceous sediments of the Vieja Group. Although the presence of the deposit indicates favorability, the uncertainty in the process that formed the mineralization makes delineation of a favorable environment or area difficult. The Allen intrusions are favorable for authigenic deposits. Basin fill in several bolsons possesses characteristics that suggest favorability but which are classified as unevaluated because of insufficient data. All Precambrian, Paleozoic, other Mesozoic, and other Cenozoic environments are unfavorable.

62725 (PGJ/F—008-82) National Uranium Resource Evaluation: Newcastle Quadrangle, Wyoming and South Dakota. Santos, E.S.; Robinson, K.; Geer, K.A.; Blattspieler, J.G. (Geological Survey, Golden, CO (USA)). Sep 1982. Contract AI13-78GJ01686. 132p. NTIS PCE07/MF $6.00. Order Number DE82021095.

Includes 15 sheets of 24x reduction microfiche. Portions of document are illegible.

Uranium resources of the Newcastle 1°x2° Quadrangle, Wyoming and South Dakota were evaluated to a depth of 1500 m (5000 ft) using available surface and subsurface geologic information. Many of the uranium occurrences reported in the literature and in reports of the US Atomic Energy Commission were located, sampled and described. Areas of anomalous radioactivity, interpreted from an aerial radiometric survey, were outlined. Areas favorable for uranium deposits in the subsurface were evaluated using gamma-ray logs. Based on surface and subsurface data, two areas have been delineated which are underlain by rocks deemed favorable as hosts for uranium deposits. One of these is underlain by rocks that contain fluvial arkosic facies in the Wasatch and Fort Union Formations of Tertiary age; the other is underlain by rocks containing fluvial quartzose sandstone facies of the Inyan Kara Group of Early Cretaceous age. Unfavorable environments characterize all rock units of Tertiary age above the Wasatch Formation, all rock units of Cretaceous age above the Inyan Kara Group, and most rock units of Mesozoic and Paleozoic age below the Inyan Kara Group. Unfavorable environments characterize all rock units of Cretaceous age above the Inyan Kara Group, and all rock units of Mesozoic and Paleozoic age below the Inyan Kara Group.

62726 (PGJ/F—012-82) National Uranium Resource Evaluation: Aztec quadrangle, New Mexico and Colorado. Green, M.W. (Geological Survey, Golden, CO (USA)). Sep 1982. Contract AI13-78GJ01686. 218p. NTIS PCE09/MF $6.20. Order Number DE82022286.

Includes 10 sheets of 24x reduction microfiche .

Areas and formations within the Aztec 1° x 2° Quadrangle, New Mexico and Colorado considered favorable for uranium endowment of specified minimum grade and tonnage include, in decreasing order of favorability: (1) the Early Cretaceous Burro Canyon Formation in the southeastern part of the Chama Basin; (2) the Tertiary Ojo Alamo Sandstone in the east-central part of the San Juan Basin; and (3) the Jurassic Westwater Canyon and Brushy Basin Members of the Morrison Formation in the southwestern part

of the quadrangle. Favorability of the Burro Canyon is based on the presence of favorable host-rock facies, carbonaceous material and pyrite to act as a reductant for uranium, and the presence of mineralized ground in the subsurface of the Chama Basin. The Ojo Alamo Sandstone is considered favorable because of favorable host-rock facies, the presence of carbonaceous material and pyrite to act as a reductant for uranium, and the presence of a relatively large subsurface area in which low-grade mineralization has been encountered in exploration activity. The Morrison Formation, located within the San Juan Basin adjacent to the northern edge of the Grants mineral belt, is considered favorable because of mineralization in several drill holes at depths near 1500 m (5000 ft) and because of favorable facies relationships extending into the Aztec Quadrangle from the Grants mineral belt which lies in the adjacent Albuquerque and Gallup Quadrangles. Formations considered unfavorable for uranium deposits of specified tonnage and grade include the remainder of sedimentary and igneous formations ranging from Precambrian to Quaternary in age. Included under the unfavorable category are the Cutler Formation of Permian age, and Dakota Sandstone of Late Cretaceous age, and the Nacimiento and San Jose Formations of Tertiary age.

62727 **(PGJ/F—013-82) National Uranium Resource Evaluation: Gallup quadrangle, Arizona and New Mexico.** Green, M.W. (Geological Survey, Golden, CO (USA)). Sep 1982. Contract AI13-78GJ01686. 164p. NTIS PCE07/MF $4.50. Order Number DE82022284.

Includes 8 sheets of 24x reduction microfiche. Portions of document are illegible.

Formations in the Gallup 1° x 2° Quadrangle, Arizona and New Mexico found favorable for endowment of uranium deposits of 100 tons of U_3O_8 at a minimum grade of 0.01 percent U_3O_8 include, in decreasing order of favorability: the Jurassic upper part of the Recapture Member and the Westwater Canyon and Brushy Basin Members of the Morrison Formation, the Jurassic Todilto Limestone, the Cretaceous Dakota Sandstone, the Cretaceous Toreva Formation, the Triassic Chinle Formation, and the Tertiary Hopi Buttes diatremes. Favorable areas are located in the Grants mineral belt of the southern San Juan Basin and adjacent areas in the Black Mesa Basin adjacent to the western boundary of the quadrangle.

62728 **(PGJ/F—014-82) National Uranium Resource Evaluation: Flagstaff Quadrangle, Arizona.** Wenrich-Verbeek, K.J.; Spirakis, C.S.; Billingsley, G.H.; Hereford, R.; Nealey, L.D.; Ulrich, G.E.; Verbeek, E.R.; Wolfe, E.W. (Geological Survey, Golden, CO (USA)). Sep 1982. Contract AI13-78GJ01686. 162p. NTIS PCE07/MF $4.40. Order Number DE82021152.

Includes 7 sheets of 24x reduction microfiche. Portions of document are illegible.

Five areas are believed to be favorable for the occurrence of uranium deposits in the Flagstaff 1°x2° quadrangle. Areas favorable for uranium deposits in collapse breccia pipes are within the Coconino and Marble Plateaus and the Little River Valley. Three areas of Mesozoic sediments are deemed favorable for the occurrence of sandstone-type deposits. Uranium mineralization is present in lakebed bearing diatremes of the Hopi Buttes. Information used to establish the favorable areas was obtained from the literature, radiometric surveys, geochemical surveys, field studies, a drilling survey in the Hopi Buttes, and air-photo interpretation.

62729 **(PGJ/F—024-82) National Uranium Resource Evaluation: Shiprock Quadrangle, Arizona, New Mexico, Colorado, and Utah.** Green, M.W.; Byers, V.P.; Condon, S.M. (Geological Survey, Golden, CO (USA)). Sep 1982. Contract AI13-78GJ01686. 161p. NTIS PCE07/MF $4.20. Order Number DE82021150.

Includes 6 sheets of 24x reduction microfiche. Portions of document are illegible.

Formations and areas in the Shiprock 1°x2° Quadrangle, New Mexico, Arizona, Colorado, and Utah, evaluated to be favorable for uranium deposits of 100 tons U_3O_8 at a minimum ore grade of 0.01% include, in decreasing order of relative favorability: (1) the Late Jurassic Salt Wash and Recapture Members of the Morrison Formation located along the western flank of the San Juan Basin; (2) the Late Triassic Shinarump Member of the Chinle Formation located in the northwest segment of the quadrangle in the vicinity of Monument Valley; (3) the Late Cretaceous Toreva Formation in the Black Mesa Basin; and (4) the Late Jurassic Westwater Canyon and Brushy Basin Members of the Morrison Formation along the western flank of the San Juan Basin. Favorability of the above rock units is based on the presence of a significant number of recognition criteria in each of the formations, as well as the presence of known uranium deposits in all stratigraphic units, except in the Westwater Canyon and Brushy Basin Members which contain none. All of the favorable units are considered favorable for sandstone-type deposits (Class 240, Subclass 243 and 244). In all units, host rocks are fluvial and fluvial-lacustrine, contain associated fine-grained impermeable facies, are carbonaceous or exhibit evidence of the former presence of organic matter, and are composed, in large part, of feldspathic sandstone. The remainder of formations and areas in the quadrangle are considered unfavorable for uranium deposits of minimum grade and tonnage because they exhibit adverse geologic and geochemical characteristics and, in general, lack uranium occurrences and radioactive anomalies. These rocks include, in order of decreasing age: (1) Precambrian rocks; (2) all Paleozoic rock formations; (3) all Mesozoic rocks except those listed above as favorable; and (4) all rock formations of Cenozoic age.

62730 **(PGJ/F—051-82) National Uranium Resource Evaluation: Cortez quadrangle, Colorado and Utah.** Campbell, J.A. (Geological Survey, Golden, CO (USA)). Sep 1982. Contract AI13-78GJ01686. 143p. NTIS PCE06/MF $4.40. Order Number DE82021093.

Includes 7 sheets of 24x reduction microfiche. Portions of document are illegible.

Six stratigraphic units are recognized as favorable for the occurrence of uranium deposits that meet the minimum size and grade requirements of the U.S. Department of Energy in the Cortez 1° x 2° Quadrangle, Utah and Colorado. These units include the Jurassic Salt Wash, Recapture, and Brushy Basin Members of the Morrison Formation and the Entrada Sandstone, the Late Triassic Chinle Formation, and the Permian Cutler Formation. Four areas are judged favorable for the Morrison members which include the Slick Rock, Montezuma Canyon, Cottonwood Wash and Hatch districts. The criteria used to determine favorability include the presence of the following (1) fluvial sandstone beds deposited by low-energy streams; (2) actively moving major and minor structures such as the Paradox Basin and the many folds within it; (3) paleostream transport directions approximately perpendicular to the trend of many of the paleofolds; (4) presence of favorable gray lacustrine mudstone beds; and (5) known uranium occurrences associated with the favorable gray mudstones. Two areas of favorability are recognized for the Chinle Formation. These areas include the Abajo Mountain and Aneth-Ute Mountain areas. The criteria used to determine favorability include the sandstone-to-mudstone ratio for the Chinle Formation and the geographic distribution of the Petrified Forest Member of the Chinle Formation. Two favorable areas are recognized for the Cutler Formation. Both of these areas are along the northern border of the quadrangle between the Abajo Mountains and the Dolores River Canyon area. Two areas are judged favorable for the Entrada Sandstone. One area is in the northeast corner of the quadrangle in the Placerville district and the second is along the eastern border of the quadrangle on the southeast flank of the La Plata Mountains.

62731 **(PGJ/F—053-82) National Uranium Resource Evaluation: Salina Quadrangle, Utah.** Lupe, R.D.; Campbell, J.A.; Franczyk, K.J.; Luft, S.J.; Peterson, F.; Robinson, K. (Geological Survey, Golden, CO (USA)). Sep 1982. Contract AI13-78GJ01686. 187p. NTIS PCE08/MF $4.80. Order Number DE82021151.

Includes 8 sheets of 24x reduction microfiche. Portions of document are illegible.

Two stratigraphic units, the Late Jurassic Salt Wash Member of the Morrison Formation and the Triassic Chinle Formation, were determined to be favorable for the occurrence of uranium deposits that meet the minimum size and grade requirements of the US Department of Energy in the Salina 1 x 2° Quadrangle, Utah. Three areas judged favorable for the Salt Wash Member are the Tidwell and Notom districts, and the Henry Mountains mineral belt. The criteria used to establish favorability were the presence

of: (1) fluvial sandstone beds deposited by low-energy streams; (2) actively moving major and minor structures such as the Paradox basin and the many folds within it; (3) paleostream transport directions approximately perpendicular to the trend of many of the paleofolds; (4) presence of favorable gray lacustrine mudstone beds; and (5) known uranium occurrences associated with the favorable gray mudstones. Four favorable areas have been outlined for the Chinle Formation. These are the San Rafael Swell, Inter River, and the Orange Cliffs subareas and the Capitol Reef area. The criteria used to establish these areas are: the sandstone-to-mudstone ratios and the geographic distribution of the Petrified Forest Member of the Chinle Formation which is considered as the probable source for the uranium.

62732 **(PGJ/F—075-82) National Uranium Resource Evaluation: Pueblo Quadrangle, Colorado.** Dickinson, K.A.; Hills, F.A. (Geological Survey, Golden, CO (USA)). Sep 1982. Contract AI13-78GJ01686. 226p. NTIS PCE09/MF $5.80. Order Number DE82021153.

Includes 13 sheets of 24x reduction microfiche. Portions of document are illegible.

Twelve favorable areas are defined in sedimentary rocks and one in igneous rocks in the Pueblo 1° x 2° Quadrangle, Colorado. All the sedimentary environments are favorable for the sandstone type (class 240) and in addition Area G could be favorable for the syngenetic phosphorite type (class 140). Two favorable areas are believed favorable for subclass 242 roll-type deposits that are similar to Texas coastal plain environments; three areas are favorable for deposits of subclass 243, peneconcordant deposits in discrete channels; three areas are favorable for deposits of subclass 244, peneconcordant deposits that are not in discrete channels; and two areas are favorable for either class 243 or class 244 or both. Unfavorable areas lacked evidence of one of the requisites for uranium mineralization or for preservation of a deposit if it formed. These areas included the following groups of rocks: Quaternary sedimentary, Tertiary sedimentary, Tertiary volcanic, Mesozoic sedimentary, Paleozoic sedimentary and Precambrian igneous.

62733 **(PGJ/F—076-82) National Uranium Resource Evaluation: Pocatello Quadrangle, Idaho.** Gallant, W.A. (Robinson (Charles S.) and Associates, Inc., Lakewood, CO (USA)). Aug 1982. Contract AC13-76GJ01664. 160p. NTIS PCE07/MF A01. Order Number DE82020956.

Includes 4 sheets of 24x reduction microfiche. Portions of document are illegible.

The Pocatello 1° x 2° Quadrangle, Idaho, was evaluated to identify and delineate areas containing geologic environments favorable for the occurrence of uranium deposits to a depth of 1500 m, using criteria developed for the National Uranium Rrsource Evaluation program. General surface reconnaissance, radiometric traverses, and geochemical sampling were conducted in all accessible geologic environments within the quadrangle, and subsurface data were evaluated. Aerial radiometric data were evaluated, and anomalies located and investigated. Known uranium occurrences were examined in detail and several new occurrences were identified. Environments considered favorable for uranium deposits are Tertiary lignite-type deposits in the southwestern part of the quadrangle. The Albion Range, including the Conner Creek area and the area south and east of the City of Rocks, was identified as an environment favorable for anatectic and vein-type uranium deposits in metamorphic rocks. The City of Rocks area is favorable for pegmatitic uranium deposits. Several areas where low-graded deposits of uranium may be found were designated unfavorable. These are the aplitic segregations of the Almo Pluton and the Tertiary tuffaceous sedimentary rocks of the Salt Lake and Starlight Formations. The thick deposits of the Salt Lake and Starlight Formations in the deep sedimentary basins, pegmatitic and metamorphic environments in buried intrusives, rhyolitic rocks beneath the basalts of the Snake River Plain, basin and range fault environments, and placer deposits adjacent to the Almo Pluton were unevaluated because of the lack of subsurface data. The area of the Fort Hall Reservation was unevaluated because permission for access was not granted.

62734 **(PGJ/F—095-82) National Uranium Resource Evaluation: Enid Quadrangle, Oklahoma and Kansas.** Eutsler, R.L.; Bloch, S.; Johnson, K.S. (Oklahoma Geological Survey, Norman (USA)). Sep 1982. Contract AC13-76GJ01664. 197p. NTIS PCE09/MF A01. Order Number DE82021653.

Includes 2 sheets of 24x reduction microfiche. Portions of document are illegible.

The uranium resources of the Enid Quadrangle, Oklahoma and Kansas, were evaluated to a depth of 1500 m using the available surface and subsurface geologic information, supplemented with an intensive geologic and geochemical reconnaissance of the quadrangle. Uranium occurrences reported in the literature were located, sampled, and described in detail. Areas of anomalous radioactivity and areas of known copper mineralization were also investigated for uranium potential. One previously known occurrence and one new occurrence were investigated in detail. All mineralized areas occur in Upper Pennsylvanian and Lower Permian strata and are uneconomic. All surface and subsurface rocks in the quadrangle are considered to possess characteristics unfavorable for uranium potential. The upper Arbuckle Group (Upper Cambrian-Lower Ordovician) was designated as an unevaluated environment. The Arbuckle has some favorable characteristics, but sufficient information is not available to consider it an environment favorable for uranium deposits.

62735 **(PGJ/F—100-82) National Uranium Resource Evaluation: La Junta Quadrangle, Colorado and Kansas.** McCarn, D.W.; Johnson, V.C.; Theis, N.J. (Bendix Field Engineering Corp., Grand Junction, CO (USA)). Sep 1982. Contract AC13-76GJ01664. 141p. NTIS PCE07/MF A01. Order Number DE82021154.

Includes 3 sheets of 24x reduction microfiche.

No environments favorable for uranium deposits occur within 1500 m (5000 ft) of the surface in the La Junta Quadrangle, Colorado and Kansas. The Triassic Dockum Group, the Jurassic Morrison Formation, and the Cretaceous Lytle Sandstone Member were studied in detail; if they exhibited favorable characteristics, they might be hosts for sandstone-type uranium deposits. However, hydrogeochemical and airborne radiometric data, the geologic literature, field examination, gamma-ray logs, and the four known occurrences do not indicate favorability. Other units in the surface and subsurface are also unfavorable. The Precambrian rocks, Pennsylvanian Morrow Formation, the Pennsylvanian and Permian Sangre de Cristo Formation, and the Cretaceous Dakota Sandstone are unevaluated.

62736 **(PGJ/F—103-82) National Uranium Resource Evaluation: Dyersburg Quadrangle, Illinois, Kentucky, Missouri, and Tennessee.** Gustavson, J.B. (Geochemex, Boulder, CO (USA)). Aug 1982. Contract AC13-76GJ01664. 166p. NTIS PCE07/MF A01. Order Number DE82020967.

Includes 4 sheets of 24x reduction microfiche. Portions of document are illegible.

Uranium resources of the Dyersburg Quadrangle, Tennessee, Kentucky, Missouri, and Illinois, were evaluated to a depth of 1500 m (5000 ft) using all available surface and subsurface geologic information. Except for the Chattanooga Shale, no uranium occurrences were reported in the literature. A scintillometer survey, geochemical sampling program (covering ground-water, soil, rock, and well-cutting samples), an Eh-meter and radon gas detector survey of the ground water, and a hydrogeochemical and stream-sediment reconnaissance program were conducted to determine anomalous radioactivity and find uranium occurrences. Information from an aerial radiometric survey was not available for this quadrangle. Areas of favorability in the subsurface were evaluated using gamma-ray logs, descriptive logs of well-sample cuttings, and published and Geochemex's ground-water data. Two areas of uranium favorability were delineated within the quadrangle. Delineation was based on surface and subsurface data. These areas lie in the fluvial to deltaic facies of the McNairy Sand of Cretaceous age. No uranium occurrences were found within these favorable areas. Geologic units considered unfavorable include all Quaternary, Tertiary, and Cretaceous (except the McNairy Sand) formations and all Paleozoic rocks extending down to the Precambrian basement rocks. An ex-

tensive drilling program in the favorable areas is recommended to improve the reliability of this evaluation.

62737 **(PGJ/F—104-82) National Uranium Resource Evaluation: Albany Quadrangle, Massachusetts, New York, Connecticut, Vermont, and New Hampshire.** Field, M.T.; Truesdell, D.B. (Bendix Field Engineering Corp., Grand Junction, CO (USA)). Sep 1982. Contract AC13-76GJ01664. 128p. NTIS PCE06/MF A01. Order Number DE82021098.

Includes 5 sheets of 24x reduction microfiche. Portions of document are illegible.

The Albany 1° x 2° Quadrangle, Massachusetts, New York, Connecticut, Vermont, and New Hampshire, was evaluated to a depth of 1500 m for uranium favorability using National Uranium Resource Evaluation criteria. Areas of favorable geology and aeroradioactivity anomalies were examined and sampled. Most Triassic and Jurassic sediments in the Connecticut Basin, in the central part of the quadrangle, were found to be favorable for sandstone uranium deposits. Some Precambrian units in the southern Green Mountains of Vermont were found favorable for uranium deposits in veins in metamorphic rocks.

62738 **(PGJ/F—137-82) National Uranium Resource Evaluation: Kingman Quadrangle, Arizona, Nevada, and California.** Luning, R.H.; Penley, H.M.; Johnson, C.L.; Dotterer, F.E. (Bendix Field Engineering Corp., Grand Junction, CO (USA)). Sep 1982. Contract AC13-76GJ01664. 69p. NTIS PCE04/MF A01. Order Number DE82021654.

Includes 4 sheets of 24x reduction microfiche. Portions of document are illegible.

Literature research, surface geologic investigations, and rock sampling were conducted for the Kingman Quadrangle, Arizona, Nevada, and California, to identify geologic environments and delineate areas favorable for uranium deposits. Favorability criteria developed during the National Uranium Resource Evaluation program were used. The studies were augmented by aerial radiometric and hydrogeochemical and stream-sediment surveys. No environments favorable for uranium deposits of at least 100 tons U_3O_8 were found. Unfavorable environments include all sedimentary, igneous, and metamorphic rocks of Precambrian to Laramide age; Tertiary volcanic sequences; and Quaternary caliche. Unevaluated environments include the Bird Spring Formation and the intermontane valleys.

62739 **(PGJ/F—138-82) National Uranium Resource Evaluation: Millett Quadrangle, Nevada.** Mitchell, T.P.; Quade, J.G. (Bendix Field Engineering Corp., Grand Junction, CO (USA). Grand Junction Operations). Sep 1982. Contract AC13-76GJ01664. 106p. NTIS PCE05/MF $4.60. Order Number DE82021155.

Includes 8 sheets of 24x reduction microfiche.

The Millett 1° x 2° National Topographic Map Series quadrangle in central Nevada was evaluated in accordance with criteria developed for the National Uranium Resource Evaluation program to determine areas favorable for uranium deposits. New and previously published radiometric, geochemical, and geologic data were used in the evaluation. Favorable allogenic environments were identified at the margins of granitic intrusions that have discordant contact zones. Eleven areas were studied in detail; of these, eight were determined to be unfavorable, and three lacked sufficient data to be evaluated.

0504 Feed Processing

62740 **(UCID—19569) Uranium from seawater.** Gregg, D.; Folkendt, M. (Lawrence Livermore National Lab., CA (USA)). 21 Sep 1982. Contract W-7405-ENG-48. 39p. NTIS, PC A03/MF A01. Order Number DE83000658.

A novel process for recovering uranium from seawater is proposed and some of the critical technical parameters are evaluated. The process, in summary, consists of two different options for contacting adsorbant pellets with seawater without pumping the seawater. It is expected that this will reduce the mass handling requirements, compared to pumped seawater systems, by a factor of approximately 10^5, which should also result in a large reduction in initial capital investment. Activated carbon, possibly in combination with a small amount of dissolved titanium hydroxide, is expected to be the preferred adsorbant material instead of the commonly assumed titanium hydroxide alone. The activated carbon, after exposure to seawater, can be stripped of uranium with an appropriate eluant (probably an acid) or can be burned for its heating value (possible in a power plant) leaving the uranium further enriched in its ash. The uranium, representing about 1% of the ash, is then a rich ore and would be recovered in a conventional manner. Experimental results have indicated that activated carbon, acting alone, is not adequately effective in adsorbing the uranium from seawater. We measured partition coefficients (concentration ratios) of approximately 10^3 in seawater instead of the reported values of 10^5. However, preliminary tests carried out in fresh water show considerable promise for an extraction system that uses a combination of dissolved titanium hydroxide (in minute amounts) which forms an insoluble compound with the uranyl ion, and the insoluble compound then being sorbed out on activated carbon. Such a system showed partition coefficients in excess of 10^8 in fresh water. However, the system was not tested in seawater.

0505 Enrichment

REFER ALSO TO CITATION(S) 62796

62741 **(K/OA—5286) Capital-recovery charges for new-product production facilities and equipment.** Wilkinson, V.K. (Union Carbide Corp., Oak Ridge, TN (USA). Nuclear Div.). 1982. Contract W-7405-ENG-26. 7p. (CONF-821115—1). NTIS, PC A02/MF A01. Order Number DE82021552.

From Conference of the Institute of Industrial Engineers; Louisville, KY, USA (14 Nov 1982).

One of the most uncertain elements in budgeting is estimating capital recovery charges for facilities and equipment required to produce items that have heretofore only been prototyped. Further compounding the problem is the desire to examine those capital recovery charges over plant lives or planting horizons as long as 30 to 50 years. This paper proposes a method to determine the appropriate production unit charge for the investment in initial and replacement facilities and equipment.

62742 **The preparation of ceramic-grade plutonium dioxide for the United States breeder program.** Haas, M.; Ramsey, H.D.; Yearwood, D.D. (LANL-U.S., Los Alamos, New Mexico 87545). *Transactions of the American Nuclear Society;* **40**: 46-48(1982). (CONF-820420—).

From International ENS/ANS conference on nuclear energy with emphasis on fuel cycles; Brussels, Belgium (26 Apr 1982).

62743 **Recent U.S. developments in technology for uranium enrichment.** Wilcox, W.J. (Union Carbide, Nucl Div-U.S., Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **40**: 7-8(1982). (CONF-820420—).

From International ENS/ANS conference on nuclear energy with emphasis on fuel cycles; Brussels, Belgium (26 Apr 1982).

0506 By-products

REFER ALSO TO CITATION(S) 62742

0507 Fuels Production And Properties

62744 **Fabrication of a $^{238}UO_3$ general-purpose heat source for space applications.** Kent, R.A.; Behrens, G.; Melton, G.F.; Zocher, R.W. (LASL, Loa Alamos, NM 87545). *Transactions of the American Nuclear Society;* **35**: 177-178(1980). (CONF-801107—).

From ANS international conference; Washington, DC, USA (17 Nov 1980).

0508 Spent Fuels Reprocessing

REFER ALSO TO CITATION(S) 62782, 63295

62745 **(Juel—1733) Method for separating radioactive krypton from the off-gas of a dissolver.** Ringel, H. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Chemische Technologie). Aug 1981. 32p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750615.

The method is based on the principle of adsorption and desorption on adsorbents. The basis for the development of the process concept are laboratory experiments corroborating the feasibility of the individual process steps. Moreover, the different adsorption processes for krypton separation described in the past are taken into account. The entire process essentially consists of three stages which are coupled together: Retention of NOsub(x) residues from the off-gas on molecular sieve and recycling the NOsub(x) with part of the waste gas into the dissolver; deposition of xenon on activated charcoal with simultaneous concentration of krypton in the off-gas; deposition of krypton from the remaining off-gas by means of preparative gas chromatography with coupled filling of pure krypton into storage cylinders containing activated charcoal.

62746 **Manpower and training for the nuclear fuel cycle.** Young, H.H. (DOE, Washington, DC 20545). *Transactions of the American Nuclear Society;* 39: 128-129(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

0509 Transport And Storage

62747 **(PNL—4189) Behavior of spent nuclear fuel and storage-system components in dry interim storage.** Johnson, A.B. Jr.; Gilbert, E.R.; Guenther, R.J. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 172p. NTIS, PC A08/MF A01. Order Number DE82022209.

Portions of document are illegible.

Irradiated nuclear fuel has been handled under dry conditions since the early days of nuclear reactor operation, and use of dry storage facilities for extended management of irradiated fuel began in 1964. Irradiated fuel is currently being stored dry in four types of facilities: dry wells, vaults, silos, and metal casks. Essentially all types of irradiated nuclear fuel are currently stored under dry conditions. Gas-cooled reactor (GCR) and liquid metal fast breeder reactor (LMFBR) fuels are stored in vaults and dry wells. Certain types of fuel are being stored in licensed dry storage facilities: Magnox fuel in vaults in the United Kingdom and organic-cooled reactor (OCR) fuel in silos in Canada. Dry storage demonstrations are under way for Zircaloy-clad fuel from boiling water reactors BWR's, pressurized heavy-water reactors (PHWRs), and pressurized water reactors (PWRs) in all four types of dry storage facilities. The demonstrations and related hot cell and laboratory tests are directed toward expanding the data base and establishing a licensing basis for dry storage of water reactor fuel. This report reviews the scope of dry interim storage technology, the performance of fuel and facility materials, the status of programs in several countries to license dry storage of water reactor fuel, and the characteristics of water reactor fuel that relate to dry storage conditions.

0510 Marketing And Economics

REFER ALSO TO CITATION(S) 62741, 62779

0520 Waste Management

REFER ALSO TO CITATION(S) 62790, 63099, 63508, 63524, 63525, 63568

62748 **(AECL—6830) Nuclide inventory for nuclear-fuel waste management: post-closure phase.** Mehta, K. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). Sep 1982. 46p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82905459.

Work performed under Canada/US Waste Management Information Exchange Agreement.

To assist research projects in the Canadian Nuclear Fuel Waste Management Program, a compilation has been made of all the nuclides that are likely to be present in a nuclear fuel waste disposal vault and that are potentially hazardous to man during the post-closure phase. The compilation includes both radiologically toxic and chemically toxic nuclides.

62749 **(BNL—31591) Waste-form development.** Neilson, R.M. Jr.; Colombo, P. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 13p. (CONF-821110—1). NTIS, PC A02/MF A01. Order Number DE82018065.

From 3. annual national low-level waste management program meeting; New Orleans, LA, USA (4 Nov 1982).

Portions of document are illegible.

Contemporary solidification agents are being investigated relative to their applications to major fuel cycle and non-fuel cycle low-level waste (LLW) streams. Work is being conducted to determine the range of conditions under which these solidification agents can be applied to specific LLW streams. These studies are directed primarily towards defining operating parameters for both improved solidification of problem wastes and solidification of new LLW streams generated from advanced volume reduction technologies. Work is being conducted to measure relevant waste form properties. These data will be compiled and evaluated to demonstrate compliance with waste form performance and shallow land burial acceptance criteria and transportation requirements (both as they exist and as they are modified with time).

62750 **(BNL-NUREG—31391) Analyses of soils at commercial radioactive-waste-disposal sites.** Piciulo, P.L.; Shea, C.E.; Barletta, R.E. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 4p. (CONF-821107—1). NTIS, PC A02/MF A01.

From 6. international symposium on the scientific basis for radioactive waste management; Boston, MA, USA (1 Nov 1982).

Brookhaven National Laboratory, in order to provide technical assistance to the NRC, has measured a number of physical and chemical characteristics of soils from two currently operating commercial radioactive waste disposal sites; one at Barnwell, SC, and the other near Richland, WA. Soil samples believed to be representative of the soil that will contact the buried waste were collected and analyzed. Earth resistivities (field measurements), from both sites, supply information to identify variations in subsurface material. Barnwell soil resistivities (laboratory measurements) range from 3.6×10^5 ohm-cm to 8.9×10^4 ohm-cm. Soil resistivities of the Hanford sample vary from 3.0×10^5 ohm-cm to 6.6×10^3 ohm-cm. The Barnwell and Hanford soil pH ranges from 4.8 to 5.4 and from 4.0 to 7.2 respectively. The pH of a 1:2 mixture of soil to 0.01 M $CaCl_2$ resulted in a pH for the Barnwell samples of 3.9 +- 0.1 and for the Hanford samples of 7.4 +- 0.2. These values are comparable to the pH measurements of the water extract of the soils used for the analyses of soluble ion content of the soils. The exchange acidity of the soils was found to be approximately 7 mg-eq per 100 g of dry soil for clay material from Barnwell, whereas the Hanford soils showed an alkaline reaction. Aqueous extracts of saturated pastes were used to determine the concentrations of the following ions: Ca^{2+}, Mg^{2+}, K^+, Na^+, HCO_3^-, SO_4/sup =/, and Cl^-. The sulfide content of each of the soils was measured in a 1:2.5 mixture of soil to an antioxidant buffer solution. The concentrations of soluble ions found in the soils from both sites are consistent with the high resistivities.

62751 (CONF-820833—10-Draft) Carbon-14 immobilization via the $Ba(OH)_2 8H_2O$ process. Haag, G.L.; Nehls, J.W. Jr.; Young, G.C. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 31p. NTIS, PC A03/MF A01. Order Number DE82020834.

From 17. DOE nuclear air cleaning conference; Denver, CO, USA (1 Aug 1982).

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The airborne release of ^{14}C from various nuclear facilities has been identified as a potential biohazard due to the long half-life of ^{14}C (5730 yrs) and the ease in which it may be assimilated into the biosphere. At Oak Ridge National Laboratory, technology is under development, as part of the Airborne Waste Management Program, for the removal and immobilization of this radionuclide. Prior studies have indicated that the ^{14}C will likely exist in the oxidized form as CO_2 and will contribute slightly to the bulk CO_2 concentration of the gas stream, which is airlike in nature (~ 330 ppMv CO_2). The technology under development utilizes the CO_2 - $Ba(OH)_2$ $8H_2O$ gas-solid reaction with the mode of gas-solid contacting being a fixed bed. The product, $BaCO_3$, possessing excellent thermal and chemical stability, prerequisites for the long-term disposal of nuclear wastes. For optimal process operation, studies have indicated that an operating window of adequate size does exist. When operating within the window, high CO_2 removal efficiency (effluent concentrations < 100 ppBv), high reactant utilization (> 99%), and an acceptable pressure drop across the bed (3 kPa/m at 13 cm/s superficial velocity) are possible. This paper will address three areas of experimental investigation. These areas are (1) micro-scale studies on 150-mg samples to provide information concerning surface properties, kinetics, and equilibrium vapor pressures, (2) macro-scale studies on large fixed beds (4.2 kg reactant) to determine the effects of humidity, temperature, and gas flow-rate upon bed pressure drop and CO_2 breakthrough, and (3) the design, construction, and initial operation of a pilot unit capable of continuously processing a 34 m^3/h (20 ft^3/min) air-based gas stream.

62752 (CONF-820833—13) Review of DOE filter-test-facility operations, 1970-1980. Burchsted, C.A. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 22p. NTIS, PC A02/MF A01. Order Number DE82020930.

From 17. DOE nuclear air cleaning conference; Denver, CO, USA (1 Aug 1982).

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The total test load for the three stations is increasing. The number of filters tested for DOE contractors is increasing. The number of filters tested per year for non-DOE customers has dropped substantially since 1978. The NRC pronouncement of filter testing has had an adverse effect on both the number of filters tested and on the quality of filters received since 1978. The test loads at Oak Ridge and Hanford are decreasing. Conversely, the test load of Rocky Flats is increasing. Significant differences in inspection, repair, and acceptance policies exist between the three stations. Significant and undesirable differences in report format and content exist between the three stations. Test machine operating practices are probably consistent from station to station, but have varied in the past. Periodic round-robins are needed to maintain and verify consistency of testing. The continued operation of the test stations is essential to maintain minimum levels of HEPA filter quality for nuclear applications.

62753 (CRDL—950355-4) Water-soluble plutonium on plenum filters. Hagan, P.G.; Miner, F.J. (Dow Chemical U.S.A., Golden, CO. Rocky Flats Div.). 11 Nov 1970. Contract AC04-76AL01106. 16p. NTIS (US Sales Only). Order Number DE82021369.

The purpose of this study is to determine the amount of water soluble plutonium which collects on plenum filters. This information is intended to aid Nuclear Safety in determining if the plutonium creates a potential nuclear safety hazard in the event of a deluge of the filter plenum system with water. From the data observed in this study, the water soluble plutonium collected on plenum filters varied from 0.2 to 89%. On the filter media itself, this solubility varied from 0.2 to 44%, and on the structural separators of the filters the water soluble plutonium varied from 10 to 89%. It is apparent from the experimental work that the plutonium collected on the filters is not of an entirely homogeneous species. Therefore, in order to determine the water soluble plutonium, a number of factors must be included such as the length of time the plutonium has been on the filter, the acidity of the filter (from absorbed acid vapors, primarily), the rate at which water is applied to the filter, the quantity of water applied, etc. Because of these many variables, the solubility values that were obtained can only be considered as representative. The best estimate of over-all water soluble plutonium was obtained using an entire sheet (~ 1858 cm^2) of filter media. With an average total plutonium loading of 16 mg on these sheets, 2.8 mg or 2.7% plutonium was found as water soluble.

62754 (DOE/NBM—2020856) Colorado State Briefing Book for low-level radioactive-waste management. (EG and G Idaho, Inc., Idaho Falls (USA); Los Alamos Technical Associates, Inc., NM (USA)). Oct 1981. Contract AC07-76ID01570. 276p. NTIS, PC A13/MF A01. Order Number DE82020856.

Portions of document are illegible.

The Colorado State Briefing Book is one of a series of state briefing books on low-level radioactive waste management practices. It has been prepared to assist state and federal agency officials in planning for safe low-level radioactive waste disposal. The report contains a profile of low-level radioactive waste generators in Colorado. The profile is the result of a survey of NRC licensees in Colorado. The briefing book also contains a comprehensive assessment of low-level radioactive waste management issues and concerns as defined by all major interested parties including industry, government, the media, and interest groups. The assessment was developed through personal communications with representatives of interested parties, and through a review of media sources. Lastly, the briefing book provides demographic and socioeconomic data and a discussion of relevant government agencies and activities, all of which may impact waste management practices in Colorado.

62755 (DOE/NBM—2020900) Arizona State Briefing Book for low-level radioactive-waste management. (EG and G Idaho, Inc., Idaho Falls (USA)). Oct 1981. Contract AC07-76ID01570. 281p. NTIS, PC A13/MF A01. Order Number DE82020900.

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The Arizona State Briefing Book is one of a series of state briefing books on low-level radioactive waste management practices. It has been prepared to assist state and federal agency officials in planning for safe low-level radioactive waste disposal. The report contains a profile of low-level radioactive waste generators in Arizona. The profile is the result of a survey of NRC licensees in Arizona. The briefing book also contains a comprehensive assessment of low-level radioactive waste management issues and concerns as defined by all major interested parties including industry, government, the media, and interest groups. The assessment was developed through personal communications with representatives of interested parties, and through a review of media sources. Lastly, the briefing book provides demographic and socioeconomic data and a discussion of relevant government agencies and activities, all of which may impact waste management practices in Arizona.

62756 (DOE/NBM—2021197-NY) New York State Briefing Book for low-level radioactive-waste management. (Envirosphere Co., New York (USA); Kane, Parsons and Associates, Inc., New York (USA)). Jun 1981. Contract AC07-76ID01570. 302p. NTIS, PC A14/MF A01. Order Number DE82021197.

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The New York State Briefing Book is one of a series of state briefing books on low-level radioactive waste management practices. It has been prepared to assist state and federal agency officials in planning for safe low-level radioactive waste disposal. The report contains a profile of low-level radioactive waste generators in New York. The profile is the result of a survey of NRC licensees in New York. The briefing book also contains a comprehensive assessment of low-level radioactive waste management issues and concerns as defined by all major interested parties including industry, government, the media, and interest groups. The assessment was developed through personal communications with representa-

tives of interested parties, and through a review of media sources. Lastly, the briefing book provides demographic and socioeconomic data and a discussion of relevant government agencies and activities, all of which may impact waste management practices in New York.

62757 **(DOE/NBM—2021200-KAN) Arkansas State Briefing Book for low-level radioactive-waste management.** (Southern States Energy Board, Atlanta, GA (USA)). Aug 1981. Contract AC07-76ID01570. 205p. NTIS, PC A10/MF A01. Order Number DE82021200.

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The Arkansas State Briefing Book is one of a series of state briefing books on low-level radioactive waste management practices. It has been prepared to assist state and federal agency officials in planning for safe low-level radioactive waste disposal. The report contains a profile of low-level radioactive waste generators in Arkansas. The profile is the result of a survey of NRC licensees in Arkansas. The briefing book also contains a comprehensive assessment of low-level radioactive waste management issues and concerns as defined by all major interested parties including industry, government, the media, and interest groups. The assessment was developed through personal communications with representatives of interested parties, and through a review of media sources. Lastly, the briefing book provides demographic and socioeconomic data and a discussion of relevant government agencies and activities, all of which may impact waste management practices in Arkansas.

62758 **(DOE/NBM—2021202-FLA) Florida State Briefing Book for low-level radioactive-waste management.** (Envirosphere Co., New York (USA); Kane, Parsons and Associates, Inc., New York (USA)). Jun 1981. Contract AC07-76ID01570. 242p. NTIS, PC A11/MF A01. Order Number DE82021202.

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The Florida State Briefing Book is one of a series of state briefing books on low-level radioactive waste management practices. It has been prepared to assist state and federal agency officials in planning for safe low-level radioactive waste disposal. The report contains a profile of low-level radioactive waste generators in Florida. The profile is the result of a survey of NRC licensees in Florida. The briefing book also contains a comprehensive assessment of low-level radioactive waste management issues and concerns as defined by all major interested parties including industry, government, the media, and interest groups. The assessment was developed through personal communications with representatives of interested parties, and through a review of media sources. Lastly, the briefing book provides demographic and socioeconomic data and a discussion of relevant government agencies and activities, all of which may impact waste management practices in Florida.

62759 **(DOE/NBM—2021214-CA) California State Briefing Book for low-level radioactive-waste management.** (NUS Corp., Rockville, MD (USA)). Dec 1981. Contract AC07-76ID01570. 181p. (NUS—3789). NTIS, PC A09/MF A01. Order Number DE82021214.

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The California State Briefing Book is one of a series of state briefing books on low-level radioactive waste management practices. It has been prepared to assist state and federal agency officials in planning for safe low-level radioactive waste disposal. The report contains a profile of low-level radioactive waste generators in California. The profile is the result of a survey of NRC licensees in California. The briefing book also contains a comprehensive assessment of low-level radioactive waste management issues and concerns as defined by all major interested parties including industry, government, the media, and interest groups. The assessment was developed through personal communications with representatives of interested parties, and through a review of media sources. Lastly, the briefing book provides demographic and socioeconomic data and a discussion of relevant government agencies and activities, all of which may impact waste management practices in California.

62760 **(DOE/NBM—2021233-GA) Georgia State Briefing Book for low-level radioactive-waste management.** (Southern States Energy Board, Atlanta, GA (USA)). Aug 1981. Contract AC07-76ID01570. 184p. NTIS, PC A09/MF A01. Order Number DE82021233.

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The Georgia State Briefing Book is one of a series of state briefing books on low-level radioactive waste management practices. It has been prepared to assist state and federal agency officials in planning for safe low-level radioactive waste disposal. The report contains a profile of low-level radioactive waste generators in Georgia. The profile is the result of a survey of NRC licensees in Georgia. The briefing book also contains a comprehensive assessment of low-level radioactive waste management issues and concerns as defined by all major interested parties including industry, government, the media, and interest groups. The assessment was developed through personal communications with representatives of interested parties, and through a review of media sources. Lastly, the briefing book provides demographic and socioeconomic data and a discussion of relevant government agencies and activities, all of which may impact waste management practices in Georgia.

62761 **(DOE/NE/44146—T1) Building the institutional capacity for managing commercial high-level radioactive waste.** (National Academy of Public Administration, Washington, DC (USA)). May 1982. Contract AC01-81NE44146. 61p. NTIS, PC A04/MF A01. Order Number DE82019468.

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This report presents the findings and recommendations of an Academy panel formed to look into the major institutional issues associated with the commercial radioactive waste management program. The two major areas examined by the Panel were: (1) intergovernmental relationships, how federal, state, local and Indian tribal council governments relate to each other in the planning and implementation of a waste management program; and (2) interagency relationships, how the federal agencies with major responsibilities in this public policy arena interact with each other. The objective of the study was to apply the perspectives of public administration to a difficult and controversial question - how to devise and execute an effective waste management program workable within the constraints of the federal system.

62762 **(DPSPU—81-30-7) Sampling and analysis of high level waste tank supernatant: an overview.** Goergen, C.R. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Plant). 1981. Contract AC09-76SR00001. 7p. (CONF-811025—28-Draft). NTIS, PC A02/MF A01. Order Number DE83000680.

From 25. conference on analytical chemistry and nuclear technology; Gatlinburg, TN, USA (6 Oct 1981).

The Savannah River Plant routinely samples its high level radioactive waste tank supernatants for analysis of major components. These results are important in maintaining proper levels of corrosion inhibiters for protection of the tank walls. Because the tank ambient temperature is elevated, the sample is heated to 70°C prior to removing aliquots for use in a variety of analytical methods. Typical analyses include density, pH, OH^-, NO_3^-, and NO_2^-, with occasional requests for $Al(OH)_4^-$, CO_3/sup =/, PO_4/sup =/, SO_4/sup =/, and various radionuclides.

62763 (Juel-Conf—40, pp 10-49) **International and national legal fundamentals of deep-sea burial of radioactive waste.** Bischof, W. Nov 1980. (In German). NTIS (US Sales Only), PC A08/MF A01.

From Meeting on deep-sea burial of radioactive wastes; Juelich, F.R. Germany (29 Jan 1980).

This report deals with the International Law concerning the seas and the appreciation of the freedom of the seas as well as the necessity of finding international regulations and controls which is due to repeated misuse. The marine disposal of radioactive waste practiced by several countries, the co-ordinated (NEA, OECD) marine disposal actions and programs, and the international agreements for water pollution control are briefly described. The various international organizations and committees investigating sea control problems and the regulations worked out by them are presented.

Moreover, the admissibility and the conditions of marine disposal of radioactive waste according to national laws as well as the problems of liability by Civil Law and International Law for damages caused by marine disposal are described.

62764 (Juel-Conf—40, pp 96-108) **Experience in deep-sea dumping.** Schwammberger, J. Nov 1980. (In German). NTIS (US Sales Only), PC A08/MF A01.

From Meeting on deep-sea burial of radioactive wastes; Juelich, F.R. Germany (29 Jan 1980).

Since 1969, Switzerland represented by the Eidg. Institut fuer Reaktorforschung (EIR) [Conferate Institute for Reactor Research], Wuerenlingen, has been participating in sea-dumping of low-level waste in the North-Eastern Atlantic Sea which takes place once a year and which is controlled by the Nuclear Energy Agency (NEA). Precious experiences could be acquired which lead to constant improvement in treatment and packaging of radioactive waste on one hand and in transportation, loading onto the vessel and unloading of the radioactive waste off the vessel into the deep sea on the other hand.

62765 (Juel-Conf—40, pp 109-121) **Requirements to be met by waste for final storage in a mine.** Bechthold, W. Nov 1980. (In German). NTIS (US Sales Only), PC A08/MF A01.

From Meeting on deep-sea burial of radioactive wastes; Juelich, F.R. Germany (29 Jan 1980).

Mines for radioactive waste storage have to meet both the demands for nuclear plants and mine facilities. The experiences acquired by test storaging in the salt deposit ASSE have been the basis for fixing the boarder conditions (storage cavities, boreholes, track network, ventilation, roads for transportation, unloading facilities, etc.) in planning the big radioactive waste storage in the Federal Republic of Germany in Gorleben. The requirements of the waste to be stored up with regard to operation phase and post-operation phase are specified. Certainly special wastes (T-, Ra-containing wastes, large components) cannot satisfy the necessary requirements without prior treatment.

62766 (Juel-Conf—40, pp 122-136) **Tritium waste in West Germany.** Lorscheider, R. Nov 1980. (In German). NTIS (US Sales Only), PC A08/MF A01.

From Meeting on deep-sea burial of radioactive wastes; Juelich, F.R. Germany (29 Jan 1980).

Published in summary form only.

62767 (Juel-Conf—40, pp 137-162) **Technical concepts for deep-sea dumping of ^{85}Kr and Tr.** Bruecher, H.; Hartmann, K.; Niephaus, D.; Nommensen, O. Nov 1980. (In German). NTIS (US Sales Only), PC A08/MF A01.

From Meeting on deep-sea burial of radioactive wastes; Juelich, F.R. Germany (29 Jan 1980).

The presented designs concern the cement solidification of tritiated water after proceeding enrichment (chemical exchange, electrolysis or zirconium-hydride formation), the filling of 28-l-pressure gas bottles with Kr-85, and the development of reusable containers for storage and transportation of the Krypton and the Tritium. Estimations are made on the basis of the 1980-prices. The legal aspects are briefly mentioned. In a final evaluation it is concluded that there are no doubts concerning technical feasibility, and that the ecological effects would not exceed the limits that can be answered for. However, for legal conditions a modification of the IAEA-definitions and -advices will be necessary.

62768 (Juel-Conf—40, pp 163-164) **Discussions and results of the seminar.** Laser, M. Nov 1980. (In German). NTIS (US Sales Only), PC A08/MF A01.

From Meeting on deep-sea burial of radioactive wastes; Juelich, F.R. Germany (29 Jan 1980).

Brief balance of the seminar on deep-sea burial of special radioactive wastes, Juelich, 29.1.1980 is given.

62769 **(Juel-Conf—40) Deep-sea burial of radioactive wastes.** Laser, M. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.)). Nov 1980. 164p. (In German). (CONF-800187—). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82750636.

From Meeting on deep-sea burial of radioactive wastes; Juelich, F.R. Germany (29 Jan 1980).

State of the art of sea dumping of radioactive wastes, legal bases, problems of ecology and environmental safety, possibilities and prospects were the goal of this seminar. Moreover, experts in ministries and members of the parliament in the Federal Republic of Germany should be supported by the results and experiences given here in order to find the legal requirements for a marine disposal of special radioactive wastes.

62770 **(LA—9396-MS) Evaluation of research and development for terminal isolation of nuclear wastes.** Burton, B.W. (Los Alamos National Lab., NM (USA)). Aug 1982. Contract W-7405-ENG-36. 26p. NTIS, PC A03/MF A01. Order Number DE82021265.

The National Waste Terminal Storage program is responsible for identifying and constructing a geologic repository for spent reactor fuel, high-level waste, and transuranic waste. Extensive research and development work is in progress in the areas of site selection, waste treatment and waste form development, model development and validation, and long-term repository performance assessment. Many potential technologies are under investigation, but specific technologies cannot be identified until a repository site is selected. It is too early in the program to assess the adequacy of environmental control technologies for deep geologic disposal.

62771 **(LA—9491-PR) Natural repository analogue program. Progress report, April 1-June 30, 1982.** Curtis, D.B. (comp.). (Los Alamos National Lab., NM (USA)). Aug 1982. Contract W-7405-ENG-36. 8p. NTIS, PC A02/MF A01. Order Number DE82021262.

Isotope dilution analyses for fissiogenic ruthenium and molybdenum in samples from Oklo reactor zone 9 and in rocks from the periphery show pronounced fractionation between ruthenium, technetium, and molybdenum. The fractionation patterns demonstrate that neither the depletion nor the enhancement of these three elements could have been solely controlled by changes in the electrochemical environment.

62772 **(LA-UR—82-2323) Decommissioning of a tritium-contaminated laboratory.** Harper, J.R.; Garde, R. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 14p. (CONF-821005—9). NTIS, PC A02/MF A01. Order Number DE82021768.

From DOE international decommissioning symposium; Seattle, WA, USA (10 Oct 1982).

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A tritium laboratory facility at the Los Alamos National Laboratory, Los Alamos, New Mexico, was decommissioned in 1979. The project involved dismantling the laboratory equipment and disposing of the equipment and debris at an on-site waste disposal/storage area. The laboratory, constructed in 1953, was in service for tritium research and fabrication of lithium tritide components until 1974. The major features of the laboratory included 25 meters of gloveboxes and hoods, associated vacuum lines, utility lines, exhaust ducts, electrodryers, blowers, and laboratory benches. This report presents details on the decommissioning, health physics, waste management, environmental surveillance, and costs for the operation.

62773 **(MLM—2969) Tritium waste control: October 1981-March 1982.** Lamberger, P.H.; Rogers, M.L. (Mound Facility, Miamisburg, OH (USA)). 16 Aug 1982. Contract AC04-76DP00053. 21p. NTIS, PC A02/MF A01. Order Number DE82021902.

Progress reports and summaries are presented for the following: electrolysis of tritiated water; impurity removal from the Combined Electrolysis Catalytic Exchange (CECE) feed water; gas generation measurements on tritiated waste materials; fixation of aqueous tritiated waste in polymer-impregnated concrete; management of high specific activity tritiated liquid wastes; and treatment of tritium contaminated water at Three Mile Island. (ATT)

62774 **(NASA-CR—161888) Analysis of space systems study for the space disposal of nuclear waste study report. Volume 2: technical report. Interim/Final report.** (Boeing Co., Seattle, WA (USA)). 1981. 360p. NTIS, PC A16/MF A01.

Reasonable space systems concepts were systematically identified and defined and a total system was evaluated for the space disposal of nuclear wastes. Areas studied include space destinations, space transportation options, launch site options, payload protection approaches, and payload rescue techniques. Systems level cost and performance trades defined four alternative space systems which deliver payloads to the selected 0.85 AU heliocentric orbit destination at least as economically as the reference system without requiring removal of the protective radiation shield container. No concepts significantly less costly than the reference concept were identified.

62775 **(NUREG/CR—2731) Evaluation of the safety aspects of the design and operation of temporary/mobile radioactive-waste solidification systems.** McDonald, F.N.; McClure, L.W. (Exxon Nuclear Idaho Co., Inc., Idaho Falls (USA)). May 1982. 44p. NTIS - GPO $4.75.

An evaluation of the safety aspects of the design and operation of temporary/mobile radioactive waste solidification systems in use at commercial nuclear power reactors was completed. The study was undertaken in response to a General Accounting Office report issued in August 1978 calling for more regulatory oversight of commercial low-level radioactive waste treatment. After reviewing the design and operation of three different vendor-operated waste solidification systems, it is clear that there are areas in which the vendors can improve their services. However, the vendors generally do a good job of solidifying waste in a manner that is well controlled and safe. 8 figures.

62776 **(ONWI—199) Rheologic properties of fresh cement mixes for repository sealing applications: effects of superplasticizers, mixing procedures, and time.** Roy, D.M.; Asaga, K. (Pennsylvania State Univ., University Park (USA). Materials Research Lab.). Sep 1982. Contract AC06-76RL01830. 48p. NTIS, PC A03/MF A01. Order Number DE83000732.

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As part of the design of optimally durable, hardened cementitious plugging materials for repository borheole plugging, shaft and tunnel sealing, detailed studies of rheological properties have been made. The effects of mixing procedures upon measured rheological properties of fresh cement mixes with and without superplasticizing admixtures condensates of sulfonated naphthalene- and melamine-formaldehyde have been investigated. Coaxial cylindrical viscometer measurements were made, recording shear stress-shear rate relationships and defining yield stress and plastic viscosity. In the absence of admixture, yield stress and plastic viscosity decreased substantially with increasing intensity of mixing, which caused a breakdown of particulate aggregates. However, with admixture present, the rheological properties of already well-dispersed mixes did not change significantly with increasingly intense mixing. The changes of the viscometric functions with time were investigated, and were related to admixture type and concentration, cement type, and volume concentration of cement. The mechanisms of action of the superplasticizers and their use in generating reliable workable low water/cement ratio mixes are discussed. 36 figures, 3 tables.

62777 **(ONWI—201) Longevity of borehole and shaft sealing materials: thermodynamic properties of cements and related phases applied to repository sealing.** Sarkar, A.K.; Barnes, M.W.; Roy, D.M. (Pennsylvania State Univ., University Park (USA). Materials Research Lab.). Sep 1982. Contract AC06-76RL01830. 55p. NTIS, PC A04/MF A01. Order Number DE83000731.

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Cements are being considered for sealing boreholes, shafts, and tunnels in nuclear waste repositories. The phases which will be stable in the long run are those which have the lowest free energies under repository conditions. In order to identify these phases, the relevant thermodynamic literature has been reviewed and evaluated, and some calculations of thermodynamic properties have been made for plausible repository conditions. Best values of heats, entropies, and free energies of formation are presented for calcium silicates, aluminates, and ferrites. Data for C-S-H gel are presented, considering the gel to have a composition of $Ca_3Si_2O_7.3H_2O$, and compared to the data for comparable crystalline phases. Equations and thermodynamic properties, including temperature dependence, are given for the hydration of cement components. Calculations for specific reactions show that hydration of tricalcium silicate should produce hillebrandite, $2CaO.SiO_2.1.17H_2O$; the presence of excess silica should make higher-silica phases such as hillebrandite, tobermorite, or others more stable. The equilibrium between tobermorite, $5CaO.6SiO_2.5.5H_2O$, and xonotlite, $6CaO.6SiO_2.H_2O$, was calculated. Calculations of free energy of reaction of aqueous ions with tricalcium aluminate to form salts show that under normal atmospheric pressure and temperature Friedel's salt, the tricalcium aluminate monochloride hydrate, is stable both in typical brines and in a basalt groundwater. Similarly, in a brine from Los Medanos in the Delaware Basin of New Mexico, the tricalcium aluminate trisulfate-hydrate ettringite is stable with respect to tricalcium aluminate and to tricalcium aluminate monosulfate hydrate, but not with respect to hydrogarnet (tricalcium aluminate hexahydrate). 3 figures, 23 tables.

62778 **(ORNL—5917) Current waste-management practices and operations at Oak Ridge National Laboratory, 1982.** Eisenhower, B.M.; Oakes, T.W.; Coobs, J.H.; Weeter, D.W. (Oak Ridge National Lab., TN (USA)). Sep 1982. Contract W-7405-ENG-26. 137p. NTIS, PC A07/MF A01. Order Number DE83000378.

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The need for efficient management of industrial chemical wastes, especially those considered hazardous or radioactive, is receiving increased attention in the United States. During the past five years, several federal laws have addressed the establishment of stronger programs for the control of hazardous and residual wastes. At a facility such as Oak Ridge National Laboratory (ORNL), an efficient waste management program is an absolute necessity to ensure protection of human health and compliance with regulatory requirements addressing the treatment and disposal of hazardous, nonhazardous, and radioactive wastes. This report highlights the major regulatory requirements under which the Laboratory must operate and their impact on ORNL facilities. Individual waste streams, estimates of quantities of waste, and current waste management operations are discussed.

62779 **(PNL—3795) Cost-benefits of a mobile, trailer-contained, vibratory-finishing decontamination facility.** Hazelton, R.F.; McCoy, M.W. (Pacific Northwest Lab., Richland, WA (USA)). Jul 1982. Contract AC06-76RL01830. 48p. NTIS, PC A03/MF A01. Order Number DE82019253.

The objective of this study was to determine the cost-benefits of a vibratory finishing process, developed at Pacific Northwest Laboratory (PNL), which has been used successfully to remove a variety of transuranic (TRU) contaminants from surfaces of metallic and nonmetallic wastes. Once TRU contaminants are removed, the metallic and nonmetallic materials can be disposed of as low-level waste (LLW). Otherwise, these materials would be disposed of in geologic repositories. This study provides an economic evaluation of the vibratory finishing process as a possible method for use in decontaminating and decommissioning retired facilities at Hanford and oher sites. Specifically, the economic evaluation focuses on a scoping design for a mobile, trailer-contained facility, which could be used in the field in conjunction with decontamination and decommissioning operations. The capital cost of the mobile facility is estimated to be about $1.09 million including contingency and working capital. Annual operating costs, including disposal costs, are estimated to be $440,000 for processing about 6340 ft^3/yr of pre-sectioned, TRU-contaminated material. Combining the operating cost and the capital cost, annualized at a discount rate of 10%, the total annual cost estimate is $602,000. The unit cost for vibratory finishing is estimated to be about $11/$ft^3$ of original reference glove box volume (Abrams et at. 1980). All costs are in first quarter 1981 dollars. Although not directly comparable, the unit cost for the vibratory finishing process is very favorable when considered beside typical, substantially higher, unit costs for processing and

geologically disposing of TUR-contaminated materials. The probable accuracy of this study cost estimate is about +- 30%. It is therefore recommended that a detailed cost estimate be prepared if a mobile facility is designed.

62780 **(PNL—4299) Deposition of volatile fission products during commercial high-level waste vitrification.** Hanson, M.S.; Carter, J.G. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1982. Contract AC06-76RL01830. 82p. NTIS, PC A05/MF A01. Order Number DE83000661.

High-level waste from spent commercial PWR fuel was vitrified during the Nuclear Waste Vitrification Project (NWVP), conducted at Pacific Northwest Laboratory in 1978 and 1979. The solidification equipment employed sintered metal filters and a conventional wet off-gas cleanup system to decontaminate the gases generated during waste processing. This report is a summary of a study completed under contract with U.S. Department of Energy (DOE) to determine the fate of volatile fission products in the filters and off-gas system. The study objectives were to determine (1) the extent of volatile fission product deposition within the sintered metal filters, (2) the distribution of fission products in the off-gas system, and (3) the factors that control the distribution. Such information is needed for the design and operation of future waste immobilization systems. The scope of the study included identification, preparation, and microprobe analyses of suitable filter samples and radiochemical analyses of off-gas system samples. The report describes the methods of sample selection and gathering, the analytical methods and results, and the interpretations of the results. Relationships to vitrification system operations are defined and operating conditions to minimize problems recommended. 37 figures, 14 tables.

62781 **(PNL—4388) Measurement of water potential in low-level waste management.** Jones, T.L.; Gee, G.W.; Kirkham, R.R.; Gibson, D.D. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 56p. NTIS, PC A04/MF A01. Order Number DE83001008.

The measurement of soil water is important to the shallow land burial of low-level waste. Soil water flow is the principle mechanism of radionuclide transport, allows the establishment of stabilizing vegetation and also governs the dissolution and release rates of the waste. This report focuses on the measurement of soil water potential and provides an evaluation of several field instruments that are available for use to monitor waste burial sites located in arid region soils. The theoretical concept of water potential is introduced and its relationship to water content and soil water flow is discussed. Next, four major areas of soils research are presented in terms of their dependence on the water potential concept. There are four basic types of sensors used to measure soil water potential. These are: (1) tensiometers; (2) soil psychrometers; (3) electrical resistance blocks; and (4) heat dissipation probes. Tensiometers are designed to measure the soil water potential directly by measuring the soil water pressure. Monitoring efforts at burial sites require measurements of soil water over long time periods. They also require measurements at key locations such as waste-soil interfaces and within any barrier system installed. Electrical resistance blocks are well suited for these types of measurements. The measurement of soil water potential can be a difficult task. There are several sensors commercially available; however, each has its own limitations. It is important to carefully select the appropriate sensor for the job. The accuracy, range, calibration, and stability of the sensor must be carefully considered. This study suggests that for waste management activities, the choice of sensor will be the tensiometer for precise soil characterization studies and the electrical resistance block for long term monitoring programs. (DMC)

62782 **(PNL—4405) Summary of non-US national and international fuel cycle and radioactive waste management programs 1982.** Harmon, K.M.; Kelman, J.A. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 106p. NTIS, PC A06/MF A01. Order Number DE82022520.

Brief program overviews of fuel cycle, spent fuel, and waste management activities in the following countries are provided: Argentina, Australia, Austria, Belgium, Brazil, Canada, China, Denmark, Finland, France, German Federal Republic, India, Italy, Japan, Republic of Korea, Mexico, Netherlands, Pakistan, South Africa, Spain, Sweden, Switzerland, Taiwan, USSR, and the United Kingdom. International nonproliferation activities, multilateral agreements and projects, and the international agencies specifically involved in the nuclear fuel cycle are also described.

62783 **(SAND—82-0621C) Isolation of radioactive wastes in salt repositories.** Weart, W.D. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 7p. (CONF-820422—1). NTIS, PC A02/MF A01. Order Number DE82008191.

From American Society of Civil Engineers conference; Las Vegas, NV, USA (26 Apr 1982).

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Salt formations have been considered for disposal of radioactive wastes since they were first suggested in 1957 by a committee of the National Academy of Science. Twenty-five years of investigation continue to support salt as a repository medium. Earlier unknowns about its behavior under repository conditions are now either understood or bounded. Practical waste packages can be designed to provide adequate containment in the most adverse of postulated repository environments. The Department of Energy (DOE) has selected a bedded salt site in southeast New Mexico to demonstrate disposal of defense transuranic waste and to conduct experiments with defense high-level waste (WIPP). Two are domes and two are bedded salt. Two shafts are drilled to the planned facility depth of 2150 feet. Waste acceptance is planned for 1989. The search for the first commerical waste repository salt site has narrowed to four locations. Construction of a commercial salt repository could start in 1993 and operation begin in 1999.

62784 **(SAND—82-0778C) Ion-beam analysis of implanted simulated nuclear-waste glasses.** Arnold, G.W.; Petit, J.C. (Sandia National Labs., Albuquerque, NM (USA); Paris-11 Univ., 91 - Orsay (France). Centre de Spectrometrie Nucleaire et de Spectrometrie de Masse). 1982. Contract AC04-76DP00789. 26p. (CONF-820945—2). NTIS, PC A03/MF A01. Order Number DE82021725.

From International conference on ion beam modification of materials; Grenoble, France (6 Sep 1982).

Portions of document are illegible.

Pb-ion implantation, used as a means of simulating α-recoil nuclei damage in nuclear waste glasses, introduces damage which affects the leach rates of the glasses. Rutherford backscattering and elastic recoil detection has been used to profile near-surface elemental compositions in leached Pb-implanted glasses. Data are given for borosilicate glasses from Savannah River Laboratories (SRP), Pacific Northwest Laboratories (PNL), the French Marcoule Laboratories, and for CFS 7740 (Pyrex). The data show wide variability in the degree of hydration and near-surface compositional changes attained as a function of Pb-ion fluence. 11 figures.

62785 **(SAND—82-1375C) Ion-implantation damage in silicate glasses.** Arnold, G.W. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 6p. (CONF-821107—3). NTIS, PC A02/MF A01. Order Number DE82020964.

From 6. international symposium on the scientific basis for radioactive waste management; Boston, MA, USA (1 Nov 1982).

Portions of document are illegible.

Ion implantation is a rapid technique for simulating damage induced by α-recoil nuclei in nuclear waste forms. The simulation has been found to be quite good in TEM comparisons with natural α-decay damage in minerals, but leach rate differences have been observed in glass studies and were attributed to dose-rate differences. The similarities between ion implantation and recoil nuclei as a means of producing damage suggest that insights into the long-term behavior of glass waste forms can be obtained by examination of what is known about ion-implantation damage in silicate glasses. This paper briefly reviews these effects and shows that leaching results in certain nuclear waste glasses can be understood as resulting from plastic flow and track overlap. Phase separation is also seen to be possible consequence of damage-induced compositional changes. 4 figures.

62786 **Air injection to modify groundwater flow.** Yow, J.L. Jr. (Lawrence Livermore National Lab., CA (USA)). *Radioactive Waste Management;* **2**: No. 3, 203-221(Mar 1982).

Several technologies either have developed or currently are using key concepts of fluid flow in porous media. These technologies are petroleum reservoir engineering, natural gas storage in aquifers, liquefied gas storage in caverns, compressed air energy storage (CAES) in caverns, CAES in aquifers, underground siting of nuclear power plants, and soil science. Key concepts include theories of effective and relative permeability and their relation to residual saturation levels. Experimental data indicate that the permeability of a medium to a given fluid varies proportionally to the cube of the fluid saturation. Therefore, it should be possible to desaturate a host geologic material and lower its permeability to water by injecting air into water-saturated geologic media. This and the initial displacement of water by air would modify the groundwater flow regime at the injection site. Such modification of permeabilities could last for hundreds of years under optimum conditions. Applications could include use of air injection to partially isolate hazardous wastes from groundwater flow. Scale and gradient effects and the influence of fluid and host media properties need further investigation.

62787 **Radioactive wastes.** Blaylock, B.G. (Oak Ridge National Lab., TN); Alexander, H.J. *Journal - Water Pollution Control Federation;* **54**: No. 6, 1002-1023(1982).

Included in the radioactive waste literature review for 1981 were three symposia summarized in four tables. The remaining literature has been divided into ten categories: general programs, isolation, waste treatment, waste management, storage, environmental transport, monitoring, transportation, risk assessment, remedial action, and socioeconomics. Included are 193 references. (JMT)

62788 **Developing public information on radioactive waste management.** Murray, R.L.; Robinson, J.V. (North Carolina State Univ, Raleigh, NC 27650). *Transactions of the American Nuclear Society;* **39**: 57(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

62789 **Potential impact of ICRP-30 on the calculated risk from waste repositories.** Croff, A.G. (ORNL, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **39**: 74-75(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

0530 Environmental Aspects

REFER ALSO TO CITATION(S) 62789, 63487, 63508, 63524, 63525

62790 **(EGG—2209) Environmental surveillance for the INEL Radioactive-Waste-Management complex. Annual report 1981.** Janke, D.H.; Zahn, T.P. (Idaho National Engineering Lab., Idaho Falls (USA)). Sep 1982. Contract AC07-76ID01570. 43p. NTIS, PC A03/MF A01. Order Number DE82021309.

The 1981 environmental surveillance report for the Radioactive Waste Management Complex of the Idaho National Engineering Laboratory contains data and discussions about routine radiological monitoring of the atmospheric, hydrologic, and geologic environments of the RWMC. Additional discussions include results of routine monitoring of two surplus facilities, the Stationary Low-Power Reactor No. 1 Surplus Area and the Organic Moderated Reactor Experiment. Each area has produced localized effects on the environment, but containment is well within the INEL site boundary.

62791 **(NUREG/CR—2873-Vol.1) Nuclear-fuel-cycle risk assessment: descriptions of representative non-reactor facilities. Sections 1-14.** Schneider, K.J. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1982. Contract AC06-76RL01830. 374p. (PNL—4306-Vol.1). GPO $9.50.

Portions of document are illegible.

The Fuel Cycle Risk Assessment Program was initiated to provide risk assessment methods for assistance in the regulatory process for nuclear fuel cycle facilities other than reactors. This report, the first from the program, defines and describes fuel cycle elements that are being considered in the program. One type of facility (and in some cases two) is described that is representative of each element of the fuel cycle. The descriptions are based on real industrial-scale facilities that are current state-of-the-art, or on conceptual facilities where none now exist. Each representative fuel cycle facility is assumed to be located on the appropriate one of four hypothetical but representative sites described. The fuel cycles considered are for Light Water Reactors with once-through flow of spent fuel, and with plutonium and uranium recycle. Representative facilities for the following fuel cycle elements are described for uranium (or uranium plus plutonium where appropriate): mining, milling, conversion, enrichment, fuel fabrication, mixed-oxide fuel refabrication, fuel reprocessing, spent fuel storage, high-level waste storage, transuranic waste storage, spent fuel and high-level and transuranic waste disposal, low-level and intermediate-level waste disposal, and transportation. For each representative facility the description includes: mainline process, effluent processing and waste management, facility and hardware description, safety-related information and potential alternative concepts for that fuel cycle element. The emphasis of the descriptive material is on safety-related information. This includes: operating and maintenance requirements, input/output of major materials, identification and inventories of hazardous materials (particularly radioactive materials), unit operations involved, potential accident driving forces, containment and shielding, and degree of hands-on operation.

0540 Health And Safety

REFER ALSO TO CITATION(S) 62775, 62791, 63487

0550 Regulations

REFER ALSO TO CITATION(S) 62761, 62763, 62769, 62778, 63286, 63290, 63291

62792 **(BLG—553) Optimization of NDA measurements in field conditions for safeguards purposes.** Menlove, H.; Keddar, A.; Griggs, J.; Bemelmans, P.; Boermans, P. (Centre d'Etude de l'Energie Nucleaire, Mol (Belgium)). Jan 1982. 23p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702678.

This report describes the results of a field test and evaluation of the Coincidence Collar for PWR fuel assemblies performed at the Franco-Belge de Fabrication de Combustibles (FBFC) facility in Dessel, Belgium from June 10-17, 1981. Comparisons are made with the results using the Prototype Neutron Coincidence Collar at the same facility described in the BLG-548 report. The main results are the following: 1. Active Assay for ^{235}U. The standard deviation for a 1000s run varied from 0.6-0.9%, depending on the type assembly. For longer counting periods, the ultimate precision was about 0.1% for repeat runs with a fixed geometry. The response curve is not saturated and continues to increase versus the enrichment increases through the normal range of LWR fuel. 2. Passive Results for ^{238}U. The counting rates for the passive measurements are much lower than for the active case. The statistical standard deviation was about 1.4% (1000s) but the results were influenced by neutron background variations.

62793 **(BNL—28014) Nuclear methods for detecting a diversion of D_2O.** Fainberg, A.; Zucker, M.S. (Brookhaven National Lab., Upton, NY (USA)). 1980. Contract AC02-76CH00016. 12p. (CONF-800655—38). NTIS, PC A02/MF A01. Order Number DE82022066.

From 21. annual meeting of the Institute of Nuclear Materials Management; Palm Beach, FL, USA (30 Jun 1980).

The possibility of diverting D_2O for use in clandestine reactors capable of weapons grade nuclear material production has created interest in safeguarding D_2O. As part of a program to investigate the technological aspects of safeguarding D_2O, several proposed nuclear based non-destructive measurement methods have

been proposed which do not require the D_2O containers to be opened. These nuclear techniques all proved workable and could lend themselves, in principle, to field application. They are neutron transmission measurements, neutron capture gamma detection, photoneutron production, and measurements of the lifetime of neutrons injected in the barrel. Since much of the instrumentation is common to several methods, more than one technique may be employed to give added assurance. 6 figures, 2 tables.

62794 **(LA—9449-MS) Field test and evaluation of the passive neutron coincidence collar for prototype fast reactor fuel subassemblies.** Menlove, H.O.; Keddar, A. (Los Alamos National Lab., NM (USA)). Aug 1982. Contract W-7405-ENG-36. 26p. NTIS, PC A03/MF A01. Order Number DE83000467.

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The passive neutron Coincidence Collar, which was developed for the verification of plutonium content in fast reactor fuel subassemblies, has been field tested using Prototype Fast Reactor fuel. For passive applications, the system measures the ^{240}Pu-effective mass from the spontaneous fission rate, and in addition, a self-interrogation technique is used to determine the fissile content in the subassembly. Both the passive and active modes were evaluated at the Windscale Works in the United Kingdom. The results of the tests gave a standard deviation 0.75% for the passive count and 3 to 7% for the active measurement for a 1000-s counting time. The unit will be used in the future for the verification of plutonium in fresh fuel assemblies.

62795 **(LA—9494-MS) Self-interrogation of spent fuel.** Lee, D.M.; Lindquist, L.O. (Los Alamos National Lab., NM (USA)). Aug 1982. Contract W-7405-ENG-36. 22p. NTIS, PC A02/MF A01. Order Number DE82021256.

A new method for the assay of spent-fuel assemblies has been developed that eliminates the need for external isotopic neutron sources, yet retains the advantages of an active interrogation system. The assay is accomplished by changing the reactivity of the system and correlating the measurements to burnup.

62796 **(SAND—82-1588C) ROBIN: a way to collect in-plant safeguards data with minimal inspector access.** Dean, F.F. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 6p. (CONF-821103—7). NTIS, PC A02/MF A01. Order Number DE82018646.

From American Nuclear Society winter meeting; Washington, DC, USA (14 Nov 1982).

A ROBot INspector (ROBIN) is being developed to collect and store both safeguards and location data from inside the nuclear facility with or without inspector access. The ROBIN is a candidate for international safeguards support at a US uranium enrichment plant. It consists of radiation, location, video, and data collection modules which are contained in a tamper-resistant enclosure. (DLC)

06 FUSION FUELS

0602 Processing

62797 **(UCID—19557) Scanning-electron-microscopy study of corrosion and surface features in glass microballoons.** Bystroff, R.I. (Lawrence Livermore National Lab., CA (USA)). 15 Sep 1982. Contract W-7405-ENG-48. 16p. NTIS, PC A02/MF A01. Order Number DE83000657.

Gaseous acid treatment (HBr) of surface-hardened binary glass microballoons results in etching and the growth of salt nodules, tubes or whiskers, depending on moisture conditions. Temperatures from 400°C to 625°C for 24 h or more are required for the effects to be significant. Numerous imperfections, including craters, are documented on the unexposed interiors surfaces. The evident phase separation and nucleation sites suggest a need for better production controls and post-production annealing. 6 figures.

0603 By-products

62798 **(DOE/ET/52026—7) Feasibility study of hydrogen production using heat from a fusion reactor. Interim report.** (Mathematical Sciences Northwest, Inc., Bellevue, WA (USA)). 18 Dec 1978. Contract AC06-78ET52026. 45p. (MSNW—1110). NTIS, PC A03/MF A01. Order Number DE82022257.

This report describes the progress to date in a feasibility study of producing H_2 using the heat of a fusion reactor. The process which is described in some detail in the report itself uses thermal dissociation of CO_2 to form CO which is then converted to H_2 in the water gas shift reactor. The analysis to date suggests that frozen mole fractions of about 15% CO can be achieved. We have determined that a key requirement is to separate out the O_2 formed in the dissociation process prior to putting the process gas containing CO through the water gas shift. This is to prevent reoxidation of the CO as well as to avoid mixture explosion. We have also determined that several ppM of H_2O vapor in the process stream has a significant effect on CO yield and the process gas mixture must be quite dry. Finally, preliminary analysis of the fusion reactor suggests that tritium breeding both within the reactor plasma as well as in the reactor blanket will be necessary to get a large fraction of the fusion energy into CO_2 dissociation.

62799 **(DOE/ET/52026—16) Feasibility study of hydrogen production using heat from a fusion reactor. Final report.** (Mathematical Sciences Northwest, Inc., Bellevue, WA (USA)). Dec 1979. Contract AC06-78ET52026. 87p. NTIS, PC A05/MF A01. Order Number DE82022256.

This report describes the results of a feasibility study of producing hydrogen (H_2) using a process based upon thermal dissociation of carbon dioxide (CO_2) into carbon monoxide (CO) and conversion of CO to H_2 in a water gas shift reactor. The primary source of energy is fusion neutron energy deposited in the form of heat in a fusion reactor blanket. The goals of the study were to achieve maximum process efficiency (chemical energy output to fusion energy input) and to use as much standard chemical processing technology as possible in designing the process cycle.

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

0702 Radiation Sources

REFER ALSO TO CITATION(S) 63558

62800 **(BNL—31855) Optical design for the NSLS crystallography beam line.** Hastings, J.B.; Suortti, P.; Thomlinson, W.; Kvick, A.; Koetzle, T.F. (Brookhaven National Lab., Upton, NY (USA); Helsinki Univ. (Finland)). 1982. Contract AC02-76CH00016. 14p. (CONF-820839—2). NTIS, PC A02/MF A01. Order Number DE83000264.

From International conference on X-ray and VUV synchrotron radiation instrumentation; Hamburg, F.R. Germany (9 Aug 1982).

The design goal of this beam line is to produce a photon beam well suited to accurate single-crystal diffraction measurements, with particular attention to the possibilities of the use of anomalous dispersion. These goals lead to the following criteria: (1) A beam uniform in intensity to 1% over an area 0.3 x 0.3 mm^2, (2) $\Delta E/E \approx 5 \times 10^{-4}$, and (3) Tunable over the energy range 5 to 21 keV accessible from a NSLS bending magnet. These criteria lead to a number of design decisions that have been applied to this and other NSLS beam lines: (1) A mirror is placed as the first optical element to better match the vertical opening angle of the photon beam to the typical rocking curves of low-index silicon Bragg peaks, reducing $\Delta E/E$ in a nondispersive, two-crystal monochromator. (2) With this mirror in place a two-crystal paralled mode monochromator with constant deviation is chosen. (3) A post-mirror to condense the radiation is placed after the monochromator. The entire optical system has been designed to operate in an ultra-high vacuum environment. The details of the mirror designs, coatings

and grazing angles are presented as well as other possible choices for these elements. Ray tracing results are given for the crystallography beam line for comparison with the design goals.

0703 Isotopic Power Supplies

REFER ALSO TO CITATION(S) 63147

08 HYDROGEN

62801 **(BNL—31668) Brookhaven National Laboratory chemical/hydrogen energy systems program overview.** Mezzina, A. (Brookhaven National Lab., Upton, NY (USA)). Jul 1982. Contract AC02-76CH00016. 7p. (CONF-820827—20). NTIS, PC A02/MF A01. Order Number DE82021569.

From Energy storage contractors review meeting; Arlington, VA, USA (23 Aug 1982).

The hydrogen technology investigation has been redirected from systems development and testing to long-term base technology development. In FY82 modest efforts have been applied to characterizing selected components and modules and to set the stage for future exploratory R & D. Advanced alkaline electrolysis modules are being subjected to endurance tests using advanced electrodes and separator materials capable of operating at elevated temperatures in order to maximize voltage efficiency at high current densities. The static feed water electrolysis concept is being developed to show the ability to electrolyze brackish water. A novel hydrogen production concept based on the catalytic decomposition of water at 500°C using zeolites is being evaluated experimentally to determine prospects for future low-cost hydrogen production when solar, fusion or fission heat sources are made available. Planning efforts involving the design of facilities and experiments to illustrate photovoltaics/electrolyzer interface have been completed. Investigation into hydrogen storage and transport have been limited to studies of hydrogen embrittlement and low-cycle fatigue testing of conventional pipeline steels which may be used to transport hydrogen. Rocket Research Corporation is completing the detailed performance mapping of the 150,000 Btu/hr H_2SO_4/H_2O Verification Test Unit by demonstrating temperature amplification over a wide range of thermal inputs and operating conditions. Southern California Gas Company and Solar Turbine, Inc. are pursuing component development for the metal hydride pair chemical heat pump. Stanford Research Institute has completed preliminary analyses supported by bench-scale testing of a process for recovering hydrogen from H_2S.

62802 **Hydrogen uses and demands through the year 2025.** Kelley, J.H.; Escher, W.J.D.; van Deelen, W. (Jet Propulsion Lab., Pasadena, Calif). *Chemical Engineering Progress;* **78**: No. 1, 58-61(Jan 1982).

This paper presents results of the R and D program on the production and application of hydrogen, initiated and conducted by the International Energy Agency (IEA) which was formed within the Organization for Economic Cooperation and Development (OECD). Forecasting data in hydrogen market in advanced countries, including the U.S., are tabulated. It is shown that hydrogen demand will grow by a factor of 12-17 in the next 45 years according to the projections by several industrial countries including the U.S. At the end of the period considered, 85% of all hydrogen produced in the participating countries is projected for use in the energy fields. Because of the role that advanced hydrogen production techniques, such as several advanced electrolytic processes and thermochemical cycles, are expected to play after the turn of the century, these processes should be further developed. 2 refs.

62803 **Hydrogen energy - Canadian realities.** Taylor, J.B. *Energy Newsletter;* **3**: No. 1, 18-24(Jan 1982).

Hydrogen is considered as an ideal fuel that can substitute for existing fuels in all energy uses. The acceptibility of synfuels from Canada's vast resources of heavy oils, tar sands, oil shales and coal is questioned because of economic and environmental factors. Economic and technological constraints on direct utilisation of hydrogen, current and projected fuel costs to 2000, hydrogen storage and implementation of its use are discussed.

0801 Production

REFER ALSO TO CITATION(S) 62798, 62890, 63306

62804 **(EUR—7042-Pt.1-Pt.2-DE) Thermochemical hydrogen production, separation procedure. Part 1. Vaporization equilibrium of the H_2O/H_2SO_4 system. Part 2. Determination of the gas and fluid material conversion coefficient as well as equilibrium solubility for the SO_2/O_2-H_2O system.** Hartmann, H. (Technische Hochschule Aachen (Germany, F.R.)). 1981. 158p. (In German). European Community Information Service, 2100 M Street NW, Washington, DC 20037.

Measurement methods are described for steam pressure and phase equilibrium measurements for the H_2O + H_2SO_4 system within a broad concentration range. A determination is made of the azeotropic point of the materials system. Tabulated data are presented on gas phase temperatures, system concentrations. 40 references, 14 figures, 47 tables.

09 OTHER SYNTHETIC AND NATURAL FUELS

0901 Hydrocarbon Fuels

REFER ALSO TO CITATION(S) 62588, 62681, 62833, 62840, 62844, 63306

62805 **(CONF-821106—7-Draft) CNG process, a new approach to physical-absorption acid-gas removal.** Hise, R.E.; Massey, L.G.; Adler, R.J.; Brosilow, C.B.; Gardner, N.C.; Brown, W.R.; Cook, W.J.; Petrik, M. (CNG Research Co., Cleveland, OH (USA); Case Western Reserve Univ., Cleveland, OH (USA); Helipump, Inc., Brecksville, OH (USA)). 1982. Contract AC21-80MC14399. 19p. NTIS, PC A02/MF A01. Order Number DE82021189.

From Annual meeting of heat transfer and energy conversion; Los Angeles, CA, USA (14 Nov 1982).

The CNG acid gas removal process embodies three novel features: (1) scrubbing with liquid carbon dioxide to remove all sulfurous molecules and other trace contaminants; (2) triple-point crystallization of carbon dioxide to concentrate sulfurous molecules and produce pure carbon dioxide; and (3) absorption of carbon dioxide with a slurry of solid carbon dioxide in organic carrier liquid. The CNG process is discussed and contrasted with existing acid gas removal technology as represented by the Benfield, Rectisol, and Selexol acid gas removal processes.

62806 **(DOE/ER/10720—4) Fischer-Tropsch synthesis over iron catalysts: the use of reactive scavengers to identify reaction intermediates.** Wang, C.Z.J.; Ekerdt, J.G. (Texas Univ., Austin (USA). Dept. of Chemical Engineering). 1982. Contract AS05-80ER10720. 32p. (CONF-821106—3). NTIS, PC A03/MF A01. Order Number DE82019549.

From Annual meeting of heat transfer and energy conversion; Los Angeles, CA, USA (14 Nov 1982).

The synthesis of hydrocarbons from H_2 and CO was studied on a silica-supported iron catalyst. The synthesis was carried out at 1.54 atmospheres and 200 to 255°C in a differential reactor. The working catalyst is realized by transforming Fe_2O_3 into a mixture of bulk carbides and iron under synthesis conditions. After the catalyst achieves a steady state condition pulses of a helium stream saturated with pyridine are injected into the reactant gas mixture. The reactor effluent is found to contain alkylpyridines. These are argued to result from pyridine reacting with the alkyl fragments which are formed on the catalyst surface from H_2 and CO. The distribution of alkylpyridines is related to the synthesis product distribution as a means of gaining insight into the synthesis mechanism. 10 figures, 1 table.

62807 **(DOE/PC/30298—T8) Soot formation in synthetic fuel droplets. Seventh quarterly technical progress report, April 1-June 30, 1982.** England, G.; Kramlich, J.; Kwan, Y.; Payne, R. (Energy and Environmental Research Corp., Irvine, CA (USA)). Aug 1982. Contract AC22-80PC30298. 17p. NTIS, PC A02/MF A01. Order Number DE82020992.

The purpose of this present research program is to investigate the details of soot formation from liquid fuel droplets and to provide information on methods of minimizing soot formation during synthetic liquid fuel combustion under conditions which minimize the formation of nitric oxides. The program comprises two main tasks, Fuel Screening Studies and Flame Studies. The purpose of the first task is to investigate the impact of fuel properties on particulate production, to establish the importance of droplet size and examine atomizer effects, and to develop techniques for surrogate fuels production. In the second task, fundamental details of soot formation from synfuel droplet combustion will be investigated in variable slip velocity configurations. During the past quarter, no new experimental effort has been initiated in the fuels screening (Task 1) section of this program. The Task 2 - Droplet Studies - phase of the program is currently in a transition stage between two different experimental efforts. Studies in a simple slip flow reactor system have been completed, and the program will move to the more complex droplet/flow field systems presented by opposed jet diffusion flame and microspray reactor systems. In the present reporting period, construction and modification of these latter two reactor systems has been completed, together with preliminary shakedown and a qualitative evaluation of performance. 7 figures.

0902 Alcohol Fuels

REFER ALSO TO CITATION(S) 62806, 62823, 62830, 62834, 62841, 62842

0904 Solid Waste And Wood Fuels

REFER ALSO TO CITATION(S) 62854, 62855, 62856, 62857, 62858, 62859, 62860, 62861, 62862, 63169, 63170, 63171, 63173, 63175

62808 **(CERL-TR-E—158) Densified biomass as an alternative Army heating and power plant fuel. Final report.** Hathaway, S.A.; Magrino, T.; Lin, J.S.; Duster, K.; Mahon, D. (Army Construction Engineering Research Lab., Champaign, IL (USA)). Mar 1980. 89p. NTIS.

This investigation evaluated the technical and economic potential of using densified biomass (principally wood pellets) as a coal substitute in Army heating and power plants. The report reviews Department of Defense (DOD) experience with and tests of wood pellets; production of wood pellets (excluding silvicultural aspects); handling, storing, and feeding; combustion; major environental considerations; and economics of use.

62809 **(LUTMDN/TMVK—3097/1-40/(1981)) Straw as energy source in a region of Southern Sweden.** Thoernqvist, L.; Macznik, J. (Tekniska Hoegskolan, Lund (Sweden)). May 1981. 64p. (In Swedish). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750043.

The region of southwestern Skaane has a straw surplus of 175000 tons per year. The geographic distribution of the surplus is presented and the technique and organisation for harvesting, storing, drying and transport are discussed. The use of straw as fuel by the growers in their own farmyards is regarded as an obstacle to utilizing straw as a regional energy resource. The environmental consequences are surveyed and the organizational models of harvesting systems are discussed.

62810 **(NE/BIO—81/21) Terminal system of Smaaland. An investigation of utilization the coppice, peat and forest litter as energy source.** Hedman, N. (Naemnden foer Energiproduktionsforskning, Stockholm (Sweden)). Mar 1981. 69p. (In Swedish). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750044.

The number and location of the terminals for the preparation of solid fuels has been dealt with in view of the situation of the energy sources and the consumers and the transport conditions. The alternative energy sources such as forest, peat and waste are considered to be interchangeable with one another and with oil and coal. The municipal central heating systems can be made to reduce the dependence on oil by 25 %. Mathematical models using a criterium of efficiency have been used. The supply of solid fuels has been found to be adequate to district heating systems and large enough for the production of pellets. It seems reasonable to erect two additional waste incinerators, namely at Naessjoe and Vetlanda. Smaller boilers can be adapted to firing pelletized peat. The use of forestry waste is more complicated to judge beacause of the competition with wood-processing industry. One terminal may be situated at the existing terminal for stocks at Hjaeltevad. A functioning fuel market for solid fuels does not exist today. Many municipalities apply for peat concessions to secure fuel supply. The state of planning concerning the reduction of oil dependence is on unequal levels, which makes it difficult for the municipalities to cooperate.

13 HYDRO ENERGY

62811 **(DOE/R4/20006—T28) Brief reconnaissance study for the addition of hydropower for Eury Dam, Troy, North Carolina.** Gebhard, T.G. Jr. (Gebhard (Thomas G.), Austin, TX (USA)). 14 Jul 1982. Contract AC44-80R420006. 20p. NTIS, PC A02/MF A01. Order Number DE82019456.

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The feasibility of developing hydroelectric power at the Eury Dam in Troy, North Carolina was studied. This dam, built in 1916 for impounding a small storage reservoir, has a developable head of 35 ft. Information is presented on: the site characteristics; the potential developer, customer power demand; environmental, institutional and safety aspects of the proposed development; power plant potential and characteristics; and the calculation of the costs and benefits of the proposal. Based on the assumptions used, hydropower development at this site was found to be economically feasible. (LCL)

62812 **(DOE/R4/20006—T29) Brief reconnaissance study for the addition of hydropower for Capelsie Dam, Capelsie, North Carolina.** Gebhard, T.G. Jr. (Gebhard (Thomas G.), Austin, TX (USA)). 14 Jul 1982. Contract AC44-80R420006. 20p. NTIS, PC A02/MF A01. Order Number DE82019455.

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The feasibility of developing hydroelectric power at the Capelsie Dam in Capelsie, North Carolina was studied. This dam, built in 1898 for diverting river flow into a canal, has a developable head of 28 ft. Information is presented on: the site characteristics; the potential developer, customer power demand; environmental, institutional and safety aspects of the proposed development; power plant potential and characteristics; and the calculation of the costs and benefits of the proposal. Based on the assumptions used, hydropower development at this site was found to be economically feasible if the cost of money is less than 15%. (LCL)

62813 **(DOE/R4/20006—T30) Brief reconnaissance study for the addition of hydropower for Sandy Creek Dam, Ramseur, North Carolina.** Gebhard, T.G. Jr. (Gebhard (Thomas G.), Austin, TX (USA)). 14 Jul 1982. Contract AC44-80R420006. 18p. NTIS, PC A02/MF A01. Order Number DE82019454.

Portions of document are illegible.

The feasibility of developing hydroelectric power at the Sandy Creek Dam in Ramseur, North Carolina was studied. This dam, built in 1978 for impounding municipal water supplies, has a developable head of 35 ft. Information is presented on: the site characteristics; the potential developer, customer power demand; environmental, institutional and safety aspects of the proposed development; power plant potential and characteristics; and the calculation of the costs and benefits of the proposal. Based on the assumptions used, hydropower development at this site was found to be economically feasible. (LCL)

62814 **(DOE/R4/20006—T31) Brief reconnaissance study for the addition of hydropower for Turnersburg Dam, Turnersburg, North Carolina.** Gebhard, T.G. Jr. (Gebhard (Thomas G.), Austin, TX (USA)). 14 Jul 1982. Contract AC44-80R420006. 18p. NTIS, PC A02/MF A01. Order Number DE82019778.

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The feasibility of developing hydroelectric power at the Turnersburg Dam in Turnersburg, North Carolina was studied. This dam, built in 1900 to provide hydromechanical power to a downstream mill, has a developable head of 24 ft. Information is presented on: the site characteristics; the potential developer; customer power demand; environmental, institutional and safety aspects of the proposed development; power plant potential and characteristics; and the calculation of the costs and benefits of the proposal. Based on the assumptions used, hydropower development at this site was found to be economically feasible if money is available at less than 15% interest. (LCL)

62815 **(DOE/R4/20006—T32) Brief reconnaissance study for the addition of hydropower for Liledoun Dam, Liledoun, North Carolina.** Gebhard, T.G. Jr. (Gebhard (Thomas G.), Austin, TX (USA)). 14 Jul 1982. Contract AC44-80R420006. 18p. NTIS, PC A02/MF A01. Order Number DE82019779.

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The feasibility of developing hydroelectric power at the Liledoun Dam in Liledoun, North Carolina was studied. This dam, built in 1920 for water impoundment, has a developable head of 22 ft. Information is presented on: the site characteristics; the potential developer, customer power demand; environmental, institutional and safety aspects of the proposed development; power plant potential and characteristics; and the calculation of the costs and benefits of the proposal. Based on the assumptions used, hydropower development at this site was found to be economically feasible if the cost of money is less than 16%. (LCL)

62816 **(DOE/R4/20006—T33) Brief reconnaissance study for the addition of hydropower for Millersville Dam, Millersville, North Carolina.** Gebhard, T.G. Jr. (Gebhard (Thomas G.), Austin, TX (USA)). 14 Jul 1982. Contract AC44-80R420006. 18p. NTIS, PC A02/MF A01. Order Number DE82019780.

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The feasibility of developing hydroelectric power at the Millersville Dam in Millersville, North Carolina was studied. This dam, built in 1930 for hydropower generation, has a developable head of 32 ft. Information is presented on: the site characteristics; the potential developer, customer power demand; environmental, institutional and safety aspects of the proposed development; power plant potential and characteristics; and the calculation of the costs and benefits of the proposal. Based on the assumptions used, hydropower development at this site was found to be economically feasible if existing equipment is repaired. (LCL)

62817 **(DOE/R4/20006—T34) Brief reconnaissance study for the addition of hydropower for Lincoln Plant Dam, Lincolnton, North Carolina.** Gebhard, T.G. Jr. (Gebhard (Thomas G.), Austin, TX (USA)). 23 Jun 1982. Contract AC44-80R420006. 19p. NTIS, PC A02/MF A01. Order Number DE82019776.

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The feasibility of developing hydroelectric power at the Lincoln Plant Dam in Lincolnton, North Carolina was studied. This dam, built in 1929 for hydropower generation, has a developable head of 13 ft. Information is presented on: the site characteristics; the potential developer, customer power demand; environmental, institutional and safety aspects of the proposed development; power plant potential and characteristics; and the calculation of the costs and benefits of the proposal. Based on the assumptions used, hydropower development at this site was found to be economically feasible if the full potential of the dam is developed. (LCL)

1303 Plant Design And Operation

62818 **(DOE/RA/01699—T1) City of Idaho Falls low-head hydroelectric demonstration project. Emergency action plan.** (Idaho Falls, City of, ID (USA). Electric Div.). Jun 1982. Contract FC07-78RA01699. 40p. NTIS (US Sales Only). Order Number DE82021385.

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The City of Idaho Falls, Idaho is nearing completion of its Bulb Turbine Project which consists of three plants: City Plant, Lower Plant, and Upper Plant. These three plant sites are located on a seven mile stretch of the Snake River. The three projects will channel water through Voest Alpine bulb turbines powering Hitachi generators. The generating facilities will have a capacity of 8000 kW each, and produce a total of 170 million kWh per year. The design flow and head at each site are 6000 cfs and 19 ft respectively. Additionally, the City has two old 1.5 MW vertical shaft units at the Lower Plant which have been retained as peaking units when sufficient flows are available. The power plants will be unmanned, and controlled by SCADA equipment from a Central Control Building. The Central Control Building will be manned 24 hr a day by a generation operator. The City of Idaho Falls is hereby applying to FERC for an exemption from filing an emergency action plan. After reviewing probable modes of failure, the emergency hazard potential, and the impacts from probable failure, the City has concluded that no reasonably foreseeable project emergency would endanger life, health or property, based upon the information contained herein.

1306 Environmental Aspects

62819 **(FERC/EIS—0034/D) Gem State Hydroelectric Project: FERC No. 2952-Idaho. Draft environmental impact statement.** (Federal Energy Regulatory Commission, Washington, DC (USA). Office of Electric Power Regulation). Sep 1982. 149p. NTIS, PC A07/MF A01. Order Number DE82021643.

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The City of Idaho Falls (Applicant) proposes to construct a hydroelectric project with an installed generating capacity of 22.3 MW on the Snake River, 5.5 miles southwest of Idaho Falls, in the Counties of Bingham and Bonneville, Idaho. The proposed project would consist of: (1) a 4300-ft-long by 40-ft-high dam; (2) a 7300-ft-long dike on the right bank; (3) a 10,400-ft-long dike on the left bank; (4) a 2900-ft-long power canal; (5) a one unit powerhouse; (6) a 1080-ft-long tailrace; (7) a 3.75-mile-long, 44-kV transmission line; and (8) appurtenant facilities. Construction would commence subsequent to issuance of a license. The environmental impact of constructing and operating this power plant and recommendations on alternatives are presented.

14 SOLAR ENERGY

1403 Economics

REFER ALSO TO CITATION(S) 62892, 63136

62820 **(DOE/ET/20279—223) Solar-photovoltaic power for broadcasting stations: an economic analysis.** Nichols, B.E.; Katzman, M.T. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). Aug 1982. Contract AC02-76ET20279. 51p. NTIS, PC A04/MF A01. Order Number DE82022498.

An economic analysis of the profitability for broadcasting stations of replacing conventional electricity with on-site solar photovoltaic power systems has been undertaken. Technological characteristics of these power systems are presented along with the economic assumptions necessary for their evaluation. Time of initial profitability, time of optimal investment, optimum system capacity, and impact of tax incentivs on profitability are analyzed for several locations in the country representative of the range of insolation conditions. The analyses indicate that photovoltaic power systems are expected, if cost predictions are met, to prove profitable for the

broadcasting market in the Southwest by the early 1980s, in the South by the mid-1980s and in the Northeast by the late 1980s. The study was performed in 1979 and was used o help design an experimental PV power system for a radio station in Ohio, which was installed in that year and has operated successfully ever since.

1404 Environmental, Legal, And Institutional Aspects

62821 (DOE/CS/34213—T6) DOE Contract 78-C-01-4213 Mod 001. Final report. (International Business Services, Inc., Washington, DC (USA)). 5 Jan 1980. Contract AC01-78CS34213. 31p. NTIS, PC A03/MF A01. Order Number DE82021641.

Market development plans were developed for the following projects: SOLCOST, Solar Index, Solar Installer Training in Correctional Institutions, Consumer Education, Contractor Licensing, and Financial Initiative. Market development plan stimulation and activation activities carried out and products developed are described for each of these projects. Also briefly described is the Solar Utilization Economic Development and Employment in Low-Income Communities program. (LEW)

62822 Methodology for an occupational risk assessment: and evaluation of four processes for the fabrication of photovoltaic cells. Ungers, L.J. (PEDCo Environmental, Inc. Cincinnati, OH); Moskowitz, P.D.; Owens, T.W.; Harmon, A.D.; Briggs, T.M. *American Industrial Hygiene Association Journal;* **43**: No. 2, 73-79(Feb 1982).

Determining occupational health and safety risks posed by emerging technologies is difficult because of limited statistics. Nevertheless, estimates of such risks much be constructed to permit comparison of various technologies to identify the most attractive processes. One way to estimate risks is to use statistics on related industries. Based on process labor requirements and associated occupational health data, risks to workers and to society posed by an emerging technology can be calculated. Using data from the California semiconductor industry, this study applies a five-step occupational risk assessment procedure to four processes for the fabrication of photovoltaic cells. The validity of the occupational risk assessment method is discussed.

1405 Solar Energy Conversion

REFER ALSO TO CITATION(S) 62804, 62808, 62809, 62810, 62822, 63137, 63169, 63170, 63171, 63173, 63175, 63270, 63316, 63320, 63537

62823 (ANL/EES-TM—184) Social cost of alcohol-fuel subsidies. Webb, S.B. (Michigan Univ., Ann Arbor (USA). Dept. of Economics). Jul 1982. Contract W-31-109-ENG-38. 14p. NTIS, PC A02/MF A01. Order Number DE82021187.

Neoclassical supply and demand curves are used to analyze the social losses resulting from government subsidies for alcohol fuels. Under present market conditions and with the subsidies now in effect, social losses account for most of the value of the government subsidies. If the subsidies were extended to cover grain ethanol used for chemical feedstocks, social losses would drop to about half the value of the government subsidy. Replacing 50% of US gasoline consumption with gasohol would result in a social cost on the order of $4 to 5 billion annually.

62824 (CONF-820906—3) Improved beam processing for terrestrial solar cells. Young, R.T.; Van der Leeden, G.A.; Westbrook, R.D.; Sandstrom, R.L.; Levatter, J.I. (Oak Ridge National Lab., TN (USA); Helionetics, Inc., San Diego, CA (USA). Laser Div.). 1982. Contract W-7405-ENG-26. 2p. NTIS, PC A02/MF A01. Order Number DE82022337.

From 16. IEEE photovoltaics specialists conference; San Diego, CA, USA (28 Sep 1982).

The major difficulties at present in using laser beam processing for terrestrial solar cells are (1) lack of a suitable laser for large volume cell production; and (2) expense and low throughput of conventional ion implantation, especially for the low energy (5 to 10 keV), high dose ($5 \times 10^{16} cm^{-2}$) implantation needed to obtain shallow p-n junctions. It is shown that these problems may be solved by using simple glow discharge implantation equipment and an XeCl excimer laser for annealing. Preliminary results indicate that with this combination, p^+n Si solar cells with efficiencies of 15% AM1 can be readily obtained without any back surface field. These efficiencies are much better than previously reported values of 11% obtained with glow discharge implantation and ruby laser annealing. Because of the shallow implant (1kV) and high discharge current (a few mA) from the glow discharge implantation and the extremely uniform laser beam from the excimer laser, cells with very shallow junctions ($\sim 0.15\mu m$) and low sheet resistivity (~ 20 Ω/sq. cm) are obtained. As a result, the front surface metal coverage of the cells can be reduced to $\sim$ 5% while retaining very good fill factors (0.77 to 0.80). Furthermore, the blue response of the cells is extremely good.

62825 (DOE/ET/20279—152) Materials, Processes, and Testing Laboratory. Technical progress report, March-June 1981. Forman, S.E.; Themelis, M.P. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). 15 Aug 1981. Contract AC02-76ET20279. 60p. NTIS, PC A04/MF A01. Order Number DE83000062.

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Test experience with photovoltaic (PV) modules at various experimental test facilities are detailed. Specific details are presented for site visits where electrically failed modules were found and replaced at Mead, Nebraska and Bryan, Ohio. Broken interconnects at all sites were reported and analyzed. A search for electrically failed modules at the Systems Test Facility (STF) array field was reported and analyzed. Several photovoltaic/thermal (PV/T) modules were analyzed for specific defects. (LEW)

62826 (DOE/JPL—1012-71) Progress report 20 for the period November 1981 to April 1982 and proceedings of the 20th Project Integration meeting. (Jet Propulsion Lab., Pasadena, CA (USA)). 1982. Contract AI01-76ET20356. 547p. (JPL-PUBL—82-48). NTIS, PC A23/MF A01. Order Number DE83000386.

Portions of document are illegible.

Described is progress made by the Flat-Plate Solar Array Project during the period November 1981 to April 1982. Reports are included on project analysis and integration; technology research in silicon material, large-area silicon sheet and environmental isolation; cell and module formation; engineering sciences, and module performance and failure analysis. A report on, and copies of visual presentations made at, the 20th Project Integration Meeting held at Pasadena, California, on April 21 and 22, 1982 are included.

62827 (DOE/JPL/955533—81-7) Development of a polysilicon process based on chemical vapor deposition: Phase I. Seventh quarterly progress report, 1 April-30 June 1981. Plahutnik, F.; Arvidson, A.; Sawyer, D. (Hemlock Semiconductor Corp., MI (USA)). 5 May 1982. Contract NAS-7-100-955533. 32p. NTIS, PC A03/MF A01. Order Number DE83000970.

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The goal of this program is to demonstrate that a dichlorosilane-based reductive chemical vapor deposition (CVD) process is capable of producing, at low cost, high quality polycrystalline silicon. Physical form and purity of this material will be consistent with LSA material requirements for use in the manufacture of high efficiency solar cells. Four polysilicon deposition runs were completed in an intermediate size reactor using dichlorosilane fed from 250 pound cylinders. Results from the intermediate size reactor are consistent with those obtained earlier with a small experimental reactor. Modifications of two intermediate size reactors were completed to interface with the dichlorosilane process demonstration unit (PDU). PDU construction was completed in May 1981. Start-up occurred June 1, 1981, on schedule. The PDU achieved a maximum DCS production rate of 47 pounds per hour with the 3" diameter redistribution reactor. No catalyst degradation has been observed during three weeks of operation.

62828 **(DOE/JPL/955909—82/2) Low-cost solar-array project cell and module formation research area. Process research of non-CZ silicon material. Quarterly report No. 2, June 1, 1982-August 31, 1982.** (Westinghouse Electric Corp., Pittsburgh, PA (USA). Advanced Energy Systems Div.). 1982. Contract NAS-7-100-955909. 32p. NTIS, PC A03/MF A01. Order Number DE82022490.

Technical work was focused on investigations of liquid diffusion masks and liquid applied dopants to replace the CVD Silox masking and gaseous diffusion operations specified for forming junctions in the Westinghouse baseline process sequence for producing solar cells from dendritic web silicon. Extensive experiments conducted during this reporting period allowed direct comparisons of the baseline diffusion masking and drive processes with those involving direct liquid applications to the dendritic web silicon strips. In these experiments, attempts were made to control the number of variables by subjecting dendritic web strips cut from a single web crystal to both types of operations. Data generated have reinforced earlier conclusions that efficiency levels at least as high as those achieved with the baseline back junction formation process can be achieved using liquid diffusion masks and liquid dopants. The use of the liquid processes will improve the cost effectiveness of the Westinghouse process sequence by reducing chemical and equipment costs, simplifying procedures and controls required for the operations, and eliminating several cleaning steps.

62829 **(DOE/JPL/956705—1) Development of metallization process FSA project, cell and module formation research area. Quarterly technical report, June 30, 1982.** Garcia, A. III. (Spectrolab, Inc., Sylmar, CA (USA)). Aug 1982. Contract NAS-7-100-956705. 17p. NTIS, PC A02/MF A01. Order Number DE83000015.

Various Mo/Sn screen printing pastes were scheduled for evaluation. Cells are first prefired in air and then fired in a H_2 atmosphere.

62830 **(DOE/R5/10239—1) Cattail-to-alcohol project. Final technical report.** (White Earth Indian Reservation, MN (USA)). 1982. Contract FG02-80R510239. 9p. NTIS, PC A02/MF A01. Order Number DE82021053.

Harvesting, grinding, and fermentation of cattails and/or their rhizomes are described. The use of antibiotics to prevent massive contamination of microorganisms and cessation of fermentation is discussed.

62831 **(EUR—7571-EN) Study of solar biotechnology based on a continuous culture of photosynthetic cells.** Gudin, C.; Chaumont, D.; Desanti, O.; Pioline, D. (Societe Francaise des Petroles BP, 92 - Courbevoie (France)). 1981. 21p. (In French). Commission of the European Communities, Directorate-General for Information Market and Innovation, Jean Monnet Building, Luxembourg.

A study is made of the role of microalgae in the production of energy, including a description of results obtained with respect to culture systems, cultivated species, energy balance, and prospects of solar biotechnology for the period 1980 to 1983 in accordance with the Heliosynthesis Project. Tabulated data are presented on average energy yield from cultures of Scenedesmus acutus and Rhodospirillum rubrum as well as diagrams illustrating solar bioconversion. 31 references, 3 figures, 3 tables.

62832 **(EUR—7689-EN) Photochemical charge separation in photosynthetic-model systems. Final report.** Schaafsma, T.J. (Landbouwhogeschool Wageningen (Netherlands)). 1982. 79p. European Community Information Service, 2100 M Street, NW, Washington, DC 20037.

The research program was comprised of three parts: (1) synthesis and purification of model compounds and complexes; (2) basic spectroscopic studies of photochemical charge-separation in model compounds and complexes of the photosynthetic unit; and (3) construction of artificial organic systems exhibiting a photovoltaic or photocurrent effect. (ACR)

62833 **(FV—80-0035-01) Producer gas 1980. Local electrical generation from wood and agricultural residues.** Kjellstroem, B. (Kungliga Vetenskapsakademien, Stockholm (Sweden)). Jun 1981. 87p. NTIS (US Sales Only), PC A05/MF A01. Order Number DE82750048.

Producer gas is a low calorie gas by partial combustion of biomass fuels. It is also called generator gas or gengas. Producer gas can be utilized as fuel for internal combustion engines and was used extensively in Sweden during the second world war to drive cars, trucks and buses. The rising oil prices led to renewed interest for producer gas. One interesting application seems to be local electricity generation with internal combustion engines using agricultural residues as feedstock for the gas generation. This paper gives a brief summary of the state-of-the-art in producer gas technology, based on a literature review and contacts with various organizations, companies and individuals working in the field. A few companies are presently offering gasifiers or complete power plants in the power range 150-1000 kW. Gasifiers or power plants in the size range 20-100 kW, using charcoal as fuel or with direct gasification of the fuel can also be obtained, but there seems to be no industrial serial production of such equipment. It is difficult to evaluate the economic feasibility of producer gas power plants since no recent experience from commercially operating plants has been found reported. Based on extrapolation of the experience from 1939-45 and some cost projections made of the companies now offering gasification equipment, it can be concluded that for utilization times of 1000 hours/year or above, producer gas power plants in the size range 20-1000 kW are probably more economic than diesel engine power plants using diesel oil only.

62834 **(GAO/EMD—82-42) Earlier effective monitoring of alcohol-fuels projects may have minimized problems.** (General Accounting Office, Washington, DC (USA). Energy and Minerals Div.). 23 Apr 1982. 16p. General Accounting Office, PO Box 6015, Gaithersburg, MD 20760.

Report to Representative Virginia Smith.

Although the Department of Energy's system for monitoring projects for the development and production of alcohol fuels now seems effective, it was not established until 7 months after some of the projects started and after major portions of them were conducted. This contributed to problems which may result in some projects not being completed after substantial portions of project funds were spent. GAO also found that 24 grantees scheduled to be paid on a reimbursable basis were erroneously advanced about $3 million. Of those grantees, only five returned a total of $378,110; and by the time the errors were detected, grantees had spent the balance of the funds advanced. Earlier effective monitoring may have detected the errors sooner, enabled more advances to be returned, and prevented a weakening of the Department's oversight and control over the projects. GAO makes recommendations which could help future projects from starting without effective monitoring.

62835 **(NASA-CR—165283) Processing of silicon solar cells by ion implantation and laser annealing. Final report.** Minnucci, J.A.; Matthei, K.W.; Greenwald, A.C. (Spire Corp., Bedford, MA (USA)). Feb 1981. 78p. NTIS, PC A05/MF A01.

Methods to improve the radiation tolerance of silicon cells for spacecraft use are described. The major emphasis of the program was to reduce the process-induced carbon and oxygen impurities in the junction and base regions of the solar cell, and to measure the effect of reduced impurity levels on the radiation tolerance of cells. Substrates of 0.1, 1.0 and 10.0 ohm-cm float-zone material were used as starting material in the process sequence. High-dose, low-energy ion implantation was used to form the junction in n+p structures. Implant annealing was performed by conventional furnace techniques and by pulsed laser and pulsed electron beam annealing. Cells were tested for radiation tolerance at Spire and NASA-LeRC. After irradiation by 1 MeV electrons to a fluence of 10 to the 16th power per sq cm, the cells tested at Spire showed no significant process induced variations in radiation tolerance. However, for cells tested at Lewis to a fluence of 10 to the 15th power per sq cm, ion-implanted cells annealed in vacuum by pulsed electron beam consistently showed the best radiation tolerance for all cell resistivities.

62836 **(NASA-CR—165485) Experimental simulation of biased solar arrays with the space plasma.** Kaufman, H.R.; Robinson, R.S. (Colorado State Univ., Fort Collins (USA)). May 1981. 71p. NTIS, PC A04/MF A01.

The phenomenon of unexpectedly large leakage currents collected by small exposed areas of high voltage solar arrays operating in a plasma environment was investigated. Polyimide (Kapton) was the insulating material used in all tests. Both positive bias (electron collection) and negative bias (ion collection) tests were performed. A mode change in the electron collection mechanism was associated with a glow discharge process and was found to be related to the neutral background density. Results indicate that the glow discharge collection mode does not occur in a space environment where the background density is considerably lower than that of the vacuum facility used.

62837 **(NASA-TM—82685) Solar cell development for the power extension package.** Baraona, C.R.; Cioni, J.L. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1981. 8p. NTIS, PC A02/MF A01.

From 16. intersociety energy conversion conference; Atlanta, GA, USA (9 Aug 1981).

The PEP is a 32 kilowatt flexible substrate, retrievable, solar array system for use on the Space Shuttle. Solar cell costs will be reduced by increasing cell area and simplifying cell and coverglass fabrication processes and specifications. The cost goal is to produce cells below $30 per watt. Two and ten ohm-cm silicon cells were investigated. In phase I of the cell development program a few thousand candidate cells will be produced and evaluated for utility and quality. In phase II a large number of cells will be fabricated to verify production readiness and cell yields and costs. This schedule is compatible with PEP initial operational capability in 1984. Approximately 140,000 large area (5.9 x 5.9 cm) cells will be required for two PEP solar arrays. The status of the cell development and testing, including a radiation damage test and side-by-side comparison of candidate cell types with pre- and post-irradiation airplane calibration of outer space short-circuit current, is reported.

62838 **(NE/BIO—81/17) Proposal for a system of felling full trees on final clearing.** Magnusson, L. (SIKOB AB, Stockholm (Sweden)). Nov 1980. 39p. (In Swedish). (SIKOB—1683). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750049.

This preliminary investigation is based on two machins, namely on a combined felling and transport unit, and delimbing - chipping machine. The system renders lower costs than the mechanized assortment shortwood system where no collection of waste takes place. The full-tree system is calculated to give a net profit of approximately 5000 SEK per ha as compared to the shortwood method.

62839 **(NE/BIO—81/22) Alder as a component of the energy forestry.** Huss-Danell, K.; Eliasson, L. (Umeaa Univ. (Sweden)). 1981. 32p. (In Swedish). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750050.

Experimental studies have been performed in order to alder trees (Alnus incana (L.) Moench.). Alder can grow rapidly owing to nitrogen fixation bacteria. The dead leaves of alder have a high nitrogen content. Nitrogen fixation was high even when the plants had moderate access to nitrogen in the form of ammonium nitrate. The nitrogen fixation activity was decreased by the treatment with occasional high amounts of nitrogen to the plants which were grown in the nitrogen of the air. Different clones of alnus exhibited a variety of growth, nitrogen fixation and biomass production. The length of cuttings could be used as an indicator of the activity of nitrogen fixation. The frequency of the plants which survived 2 to 3 years, was 72-100 %. The alnus has favourable qualifications for energy forestry, owing to : (1) Good nitrogen fixation (2) Good productivity in young plantation (3) Simple reproduction by cuttings and rooting (4) Possible genetical improvement (5) Not being consumed by the deers.

62840 **(NP—2750047) Biogas in Denmark. Report in some approaches to continuous digestion of cattle manure and mixed cattle/pig manure from Asssendrup and Graasten.** Hansen, S.; Jensen, A.V.; Joergensen, P.J.; Berg, R. (STUB Samarbejdsgruppen for Teknologisk Udvikling af Biogas, Glostrup (Denmark)). Apr 1980. 46p. (In Danish). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750047.

Some biogas experiments were accomplished on laboratory scale in a continuous flow-through reactor with stirring. The used biomatter was in some cases cattle-manure, in other mixture of cattle-swine manure. Digestion tests were done in mesophilic temperature (ca 35degC). The purpose of the tests was to establish the most essential variables such as durability of the production period and the batch size. Gas production was measured continuously and the maximum methane yield (Bsub(o)) was estimated for both types of manure. Tables and diagrams for the specific methane production (γ) as a function of operational parameters were prepared.

62841 **(NP—2906030) Alternative-Liquid-Fuels Project. Volume I. Fuel alcohols and their potential in Alabama, 1977-1978.** (Alabama Univ., University (USA). School of Mines and Energy Development). 1978. 78p. NTIS, PC A05/MF A01. Order Number DE82906030.

Portions of document are illegible.

The history of fuel alcohols is described briefly. The state of the art of biomass energy conversion is described including federal government programs, industry programs, and foreign programs. Major issues of the fuel alcohol proposal in the US are presented.

62842 **(NP—2906050) Alternative-liquid-fuels project. Volume II. Alcohol-fuels information update.** Herz, W.J. (Alabama Univ., University (USA). School of Mines and Energy Development). 1980. 26p. NTIS, PC A03/MF A01. Order Number DE82906050.

The demand for alcohol fuels, production processes and economics, energy balance, engine performance, environmental impact, Alabama's role, and the major developmental work needed are discussed. The practical aspects of ethanol fuel production and usage are presented as follows: steps in the ethyl alcohol fermentation proces; raw materials selection; cooking and conversion; fermentation; distillation; alcohol as a fuel; economic aspects; and suppliers, contractors, and organizations.

62843 **(SERI/TP—234-1650) Biomass electrochemical research at SERI.** Chum, H.L. (Solar Energy Research Inst., Golden, CO (USA)). Jun 1982. Contract AC02-77CH00178. 14p. (CONF-820676—3). NTIS, PC A02/MF A01. Order Number DE82019101.

From SERI biomass program principal investigators review meeting; Washington, DC, USA (23 Jun 1982).

Electrochemical processing is being applied to biomass and derived materials to upgrade their energy content thereby generating fuels (or additives) or petrochemical substitutes, or increasing their reactivity and value for a variety of applications of the polymeric materials. The utilization of the following are addressed: (1) lignin polymers, which are not suitable substrates for anaerobic digestion to fuels and chemicals. The approach is to investigate relatively simple lignin derived materials which, in principle, can be produced in large quantities, and serve as models for the behavior of more complex materials. The lignin of choice is derived from an atypical and abundant hardwood such as aspen (Populus tremuloides), which has been pretreated by explosive depressurization (steam explosion) and is ethanol extracted. The aim is to change the degree of polymerization of these materials, and to increase their suitability as a replacement of phenol in phenol-formaldehyde thermosetting resins. In order to understand these processes in complex lignin molecules, synthesized lignin model compounds have been synthesized and their electrochemical reactions are investigated; (2) carboxylic acids, which can be obtained by suppressing the methane formation in anaerobic digestion processes. The approach is to develop new separation methods for the carboxylic acids and innovative ways of electrochemically processing dilute solutions to gaseous and/or water-insoluble products; (3) the upgrading of waste streams from biomass (terrestrial and aquatic) processing, electro-

chemically or photoelectrochemically. The waste streams under consideration include those from acid hydrolysis, fermentation, and alkaline treatment (e.g., kraft pulping), which contain a variety of polyfunctional carboxylic acids, amenable to electrochemical processing.

62844 **(SERI/TR—622-1172) SERI high-pressure, molecular-beam mass-spectrometric sampling system.** Soltys, M.N.; Milne, T.A. (Solar Energy Research Inst., Golden, CO (USA)). Sep 1982. Contract AC02-77CH00178. 38p. NTIS, PC A03/MF A01. Order Number DE83001233.

The theory of high pressure, molecular-beam mass spectrometric sampling is briefly reviewed, with a discussion of the principal phenomena that affect results. The hardware and circuits of the sampling and data acquisition system are described. Finally, system performance and capability are reviewed. Representative data outputs are included.

62845 **Electrodeposition of solar silicon.** Elwell, D.; Feigelson, R.S. (Stanford Univ., CA). *Solar Energy Materials;* **6**: No. 2, 123-145(Jan 1982).

A review is presented of experimental data on the electrodeposition of silicon from molten salt and organic solutions, with emphasis on studies reported in the last three years. The potential of this method for photovoltaic applications is considered. Electrodeposition of silicon at temperatures above its melting point is a promising method of producing inexpensive silicon to be recrystallized by pulling or casting crystals. Deposition of layers onto graphite by electrowinning or electrorefining requires a relatively slow deposition rate but has the advantage of eliminating several processing steps.

62846 **Temperature dependence of silicon solar cell characteristics.** Arora, N.D.; Hauser, J.R. (North Carolina State Univ., Raleigh, NC). *Solar Energy Materials;* **6**: No. 2, 151-158(Jan 1982).

The effects of temperature on the characteristics of p-n junction solar cells are investigated theoretically. An exact numerical model of the semiconductor transport equations is used to calculate the output parameters of the cell taking into account temperature effect on the material parameters of the cell. These calculations show that the temperature coefficient of solar cell parameters such as open-circuit voltage, short-circuit current, efficiency, etc., are typically nonlinear over the range of temperature (300 to 450°K) studied in agreement with the experimental results as against a constant value obtained by simple calculations.

62847 **Theoretical investigations of the photoexcited semiconductor electrode.** Soliman, A.A.; Seguin, H.J.J. (Univ. of Alberta, Edmonton). *Solar Energy Materials;* **6**: No. 2, 201-219(Jan 1982).

Theoretical investigations of the behaviour of the semiconductor electrode in photoelectrochemical cells are presented. The semiconductor/electrolyte interface is treated simply as a Schottky barrier, and the analysis takes into account the effect of surface reaction rates at the interface. Expressions for current density and spectral response for an electrode incorporating an inhomogeneous doping profile are derived in terms of the physical properties of the semiconductor. A formulation for the depletion region width due to nonuniform impurity distribution is included. Numerical simulation of the derived expressions are carried out for a photoexcited TiO_2 electrode, and curves representing the current density versus wavelength, quantum efficiency versus wavelength and total current density versus different physical parameters are illustrated.

62848 **Photovoltaic power generation.** Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982). 447p. (EUR—7665; CONF-8111107—). D. Reidel Publishing Company, Inc., 190 Old Derby St., Hingham, MA 02043.

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

Separate abstracts were prepared for 28 papers in this conference proceedings. (LEW)

62849 **Design and costs of support structures.** Gloeckl, J.; Helm, P.; Traeder, K. (Wirtschaft und Infrastruktur GmbH and Co., Muenchen, Germany). pp 2-8 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

Surveyed are different support structures for PV panels. The standardized description of some of the designs developed by the contractors participating in the EC Solar Energy R and D Programme is given. Thereafter a newly developed low-cost structure will be presented, based on elements commonly used for fence constructions. Finally, trade-off methods to arrive at an optimization in terms of total costs for support structures have been described.

62850 **Wind loading considerations in photovoltaic structural design.** Stouffer, R.; Macomber, H.L. (MONEGON, Ltd., Gaithersburg, MD). pp 9-30 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

The determination of the design wind speed for photovoltaic installation is considered as are the static and dynamic forces created by the wind. The American National Standards Institute (ANSI) code as applied to PV structural design is reviewed and guidelines presented. In addition, representative European codes are reviewed and compared. Techniques for reducing wind loading on arrays are presented along with wind tunnel test results.

62851 **Recommended equipment and procedures for the determination of the rated power of photovoltaic arrays.** Treble, F.C. pp 146-151 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

Standard equipment and procedures are proposed for measuring in situ the performance characteristics of photovoltaic arrays in the CEC Pilot Projects Programme, extrapolating the characteristics to standard conditions of irradiance and temperature and deriving therefrom the rated or peak power of each array. In order to minimize errors caused by differences in spectral irradiance between standard sunlight and the sunlight in which the measurements are carried out, it is recommended that the irradiance be measured by specially selected reference solar cells, calibrated in terms of their short circuit currents in standard sunlight at 1000 Wm^{-2} by one of the four European calibration agencies.

62852 **The DOE photovoltaics research and development program.** *Transactions of the American Nuclear Society;* **39**: 10(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

62853 **Hydrocarbons from Euphorbia lathyris.** Nemethy, E.K.; Otvos, J.W.; Calvin, M. (Univ. of California, Berkeley). *Pure and Applied Chemistry;* **53**: 1101-1108(1981). Contract W-7405-ENG-48.

Euphorbia lathyris, a plant which has been proposed as a "energy farm" candidate yields a total of 35% of its dry weight as a simple organic extractables. Chemical analyses of the extracts show that 5% of the dry weight is a mixture of reduced terpenoids, in the form of triterpenoids, and 20% of the dry weight is simple sugars in the form of hexoses. The terpenoids can be converted to a gasolne-like substance and the sugars can be fermented to alcohol. Based on a biomass yield of ten dry tons $acre^{-1}$ $year^{-1}$, the total energy that can be obtained from this plant in the form of liquid fuels is 45 X 10^6 BTU $acre^{-1}$ $year^{-1}$.

62854 **National energy condition and the wood fuel option.** Stelson, T.E. pp 2-15 of Proceedings documents for wood heating seminars, 1980/1981. Washington, DC; Wood Heating Alliance (1981).

From 6. Wood heating seminar; Atlanta, GA, USA (25 February 1980).

The national energy situation and the positions of President Carter, Secretary Duncan, and the US DOE are summarized. A pragmatic analysis of some energy options is included. The place of wood fuels in the energy picture is described.

62855 **EPA's research program for controlling residential wood combustion emissions.** Hall, R.E. (Environmental Protection Agency, Research Triangle Park, NC). pp 44-63 of Proceedings documents for wood heating seminars, 1980/1981. Washington, DC; Wood Heating Alliance (1981).

From 6. Wood energy institute seminar; Atlanta, GA, USA (27 Feb 1980).

A recently completed study has shown that emissions of particulate, carbon monoxide, and organics (including polycyclic organic matter) are relatively high from residential wood-burning stoves and fireplaces when compared to emissions from residential gas- and oil-fired furnaces. Since these emissions include a number of potentially hazardous compounds, the trend toward greater residential wood usage can have a negative impact on local ambient air quality. EPA is currently studying ways to operate existing stoves and design new stoves to minimize air pollutant emissions.

62856 **Wood-fired central heating equipment.** Engblom, D. (Underwriters Labs., Inc., Northbrook, IL). pp 64-72 of Proceedings documents for wood heating seminars, 1980/1981. Washington, DC; Wood Heating Alliance (1981).

From 6. Wood heating seminar; Atlanta, GA, USA (25 Feb 1980).

Problems with wood-fired central heating equipment are discussed. Recommendations are made for improvements in the design of wood burning equipment.

62857 **Ambient air assessment in a rural New England village where wood is the dominant fuel.** Hornig, J.F. (Dartmouth College, Hanover, NH); Soderberg, R.H.; Larsen, D.; Parravano, C. pp 140-153 of Proceedings documents for wood heating seminars, 1980/1981. Washington, DC; Wood Heating Alliance (1981).

From 8. Wood heating seminar; New Orleans, LA, USA (21 February 1981).

During the 1979-1980 heating season, fifty standard hi-vol filter samples of ambient air were taken in a small town and in semi-rural areas in New Hampshire where wood is the dominant heating fuel. In addition to total suspended particulate (TSP) values, concentrations of 12 polycyclic organic materials (POM), 10 of which are priority pollutants, were determined using HPLC with uv and fluorescence detection, and by GC/MS techniques. Concentrations of benzo(a) pyrene were found to be in the range 0.5 to 0.8 ng/m^3. The measurements will be compared to recently published POM values from diverse sources. This comparison will include discussion of troublesome methodological problems which potentially compromise ambient air POM analyses.

62858 **Catalytic combustion in residential wood stoves.** VanDewoestine, R.V.; Zimar, F.; Allaire, R.A. (Corning Glass Works, NY). pp 154-166 of Proceedings documents for wood heating seminars, 1980/1981. Washington, DC; Wood Heating Alliance (1981).

From 8. Wood heating seminar; New Orleans, LA, USA (21 February 1981).

A catalytic combustor for wood stoves has been developed that reduces accumulation of creosote in flues and chimneys, reduces air pollution and improves stove efficiencies. The potential now exists to bring wood combustion to levels of safety and efficiency comparable to fossil fuel combustion.

62859 **Measurements of chemical changes due to catalysis of woodstove effluent.** Jaasma, D.R. (Virginia Polytechnic Inst. and State Univ., Blacksburg). pp 221-230 of Proceedings documents for wood heating seminars, 1980/1981. Washington, DC; Wood Heating Alliance (1981).

From 8. Wood heating seminar; New Orleans, LA, USA (21 February 1981).

Pollutant emissions from woodstoves are responsible for chimney fires and may also have a serious effect on human health. Since woodstove stack emissions contain negligible amounts of sulfur oxides, nitrogen oxides, and ash, all of the pollutants of concern are combustibles and can be eliminated by oxidation to CO_2 and H_2O. Use of a catalyst to encourage the oxidation process is an attractive idea from both energy conservation and air pollution standpoints. Potential problems with use of a catalyst to reduce emissions to acceptable levels include fouling before operating temperature is reached, production of secondary products such as ammonia or hydrogen cyanide during fuel-rich operation, and a draft requirement in excess of that required by conventional chimneys. The recent commercial debut of a stove containing a monolithic catalyst indicates that start-up and natural draft operation can be achieved, but details on the chemical nature of the effluent are not yet available. Experiments to characterize the chemical and physical transformations of woodstove effluent as it passes over a noble metal catalyst are now under way at the VPI Solid Fuels Research Laboratory. Preliminary results are presented and discussed.

62860 **Preliminary analysis of the ambient impacts of residential woodburning in Waterbury, Vermont.** Sanborn, C.R.; Poirot, R.L.; Heil, G.A.; Blanchet, M.A. (Agency of Environmental Conservation, Montpelier, VT). pp 231-241 of Proceedings documents for wood heating seminars, 1980/1981. Washington, DC; Wood Heating Alliance (1981).

From 8. Wood heating seminar; New Orleans, LA, USA (21 February 1981).

During the winter of 1979/80, the Agency of Environmental Conservation conducted an ambient air monitoring program in Waterbury, Vermont to study the effects of residential woodburning on particulate levels within the Village. Prior to setting up the ambient monitoring program, a door-to-door survey was conducted in the Village to determine the number of wood users and their location. The siting of the high-volume samplers was based on this information. In all five sampling sites for the measurement of Total Suspended Particulates (TSP) were set up. The data collected at these sampling sites and a meteorological station was used in conjunction with modeling and regression techniques to predict the contribution of woodburning to the TSP levels in Waterbury. Based on these techniques, it was estimated that up to 35% of the measured TSP could be due to residential woodburning.

62861 **Pollution and fireplaces in California.** Kosel, P.H. (California Air Resources Board, Sacramento). pp 242-251 of Proceedings documents for wood heating seminars, 1980/1981. Washington, DC; Wood Heating Alliance (1981).

From 8. Wood heating seminar; New Orleans, LA, USA (21 February 1981).

An examination of air pollution test results and the demography of woodburning in California indicates that although woodburning is less important than some other urban pollution sources, it may be a major contributor to pollution in some residential areas. To reduce emissions from woodburning equipment, it is better to apply design specifications to new equipment than to impose emission limits on existing equipment. The potential for marketing retrofit devices and hints for more efficient and less polluting woodburning are discussed.

62862 **Wood energy: the North Carolina effort.** Wainwright, P.B. (North Carolina Department of Natural Resources and Community Development, Raleigh). pp 260-265 of Proceedings documents for wood heating seminars, 1980/1981. Washington, DC; Wood Heating Alliance (1981).

From 8. Wood heating seminar; New Orleans, LA, USA (21 February 1981).

The state of North Carolina is committed to wood as an alternative energy source and at the same time recognizes its responsibility to the environment. Because of conflicting Polycyclic Organic Material (POM) emission data available the state of North Carolina has undertaken a sampling study for POM emissions from wood fired boilers. The North Carolina wood energy project and the POM sampling study will be discussed.

1406 Photovoltaic Power Systems

REFER ALSO TO CITATION(S) 62820, 62835, 62836, 62837, 62848, 62849, 62850, 62851, 62852, 62900

62863 **(DOE/CH/10122—3) Analysis of selected photovoltaic systems and storage options for residential applications in hot, humid climates.** Lau, A.S.; Hill, J.M.; Ball, D.E. (ESG, Inc., Atlanta, GA (USA)). Aug 1982. Contract AC02-82CH10122. 89p. NTIS, PC A05/MF A01. Order Number DE82020531.

Portions of document are illegible.

The relationship is studied between photovoltaic (PV) generated power and its on-site use as a function of total array size for an energy-efficient house in the hot, humid climates of Miami and Houston. Options in addition to the full-roof system using a direct current (dc) to alternating current (ac) inverter are studied in an effort to identify applications which are less expensive and which rely less on utility sellback. The results show that common residential loads in this climate lead to high on-site utilization. For the various PV applications studied, array sizes are identified which can be fully utilized on-site, ranging from 1 to 4 kWp. Significant thermal storage potential is identified both in the house structure and the domestic water heater. Using projected 1986 costs, the economics of selected systems were studied for Miami. Only one of the system sizes was found to be marginally competitive with utility supplied power.

62864 **(DOE/ET/20279—199) Design and fabrication of a prototype system for photovoltaic residences in the Northeast. Final report.** Pittman, P.F.; Dressler, R.T. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Advanced Energy Systems Div.). Jun 1982. Contract AC02-76ET20279. 115p. NTIS, PC A06/MF A01. Order Number DE82022210.

Portions of document are illegible.

A single-family residence including a solar photovoltaic power system was designed for the Northeast. The residence utilizes passive solar and energy conservation techniques to minimize the annual electrical load. A prototype of the electrical system was constructed at the Northeast Residential Experiment Station and maintained for one year. The array is integrally mounted using a new panel installation concept, and produces 5.7-kW peak at Standard Test Conditions (100 mW/cm², 28°C, AM 1.5). The system is interactive with the utility and uses a voltage-fed, self-commutated power conditioner. The system operates automatically training on and off as the sun rises and sets.

62865 **(DOE/ET/20279—224) Design and fabrication of a prototype system for a photovoltaic residence in the Northeast.** (Solarex Corp., Rockville, MD (USA); Mueller Associates, Inc., Baltimore, MD (USA); Price and Partners, Takoma Park, MD (USA)). Aug 1982. Contract AC02-76ET20279. 87p. D. Order Number DE82022497.

This project consisted of the design, fabrication, and testing of a photovoltaic residence which is suitable for construction in the Northeast. A full-size residence was designed which included energy-conserving and passive features, and the energy performance of the residence was completed for a 5-kW PV array in a standoff configuration. Actual construction consisted of the roof structure and a building enclosure large enough to contain the PCU, test equipment, and load-simulation equipment. The PV array consists of 78 modules along with a line tie inverter.

62866 **(SAND—81-7086/12) Intermediate photovoltaic system application experiment operational performance report for Newman Power Station, El Paso, Texas.** (Sandia National Labs., Albuquerque, NM (USA); Boeing Computer Services Co., Seattle, WA (USA)). Aug 1982. Contract AC04-76DP00789. 33p. NTIS, PC A03/MF A01.

Presented are the data accumulated during May at the intermediate photovoltaic project at Newman Power Station, El Paso, Texas. Generated energy and environmental (weather) data are presented graphically. Explanations of irregularities not attributable to weather are provided.

62867 **Wiring, cabling and termination considerations.** Macomber, H.L. (MONEGON, LTD. Gaithersburg, MD). pp 31-42 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

Key factors and considerations are examined for cabling and terminations in the electrical design efforts for photovoltaic power plant system design. These factors include the cabling conductor, insulator, sheath, shielding, safety, reliability and installation. For the terminations the factors considered included module and structure requirements, electrical constraints, environmental considerations, selection criteria and types, safety and costs.

62868 **Power conditioning and control systems.** Starr, M.R. (Sir William Halcrow and Partners, Swindon, England); Macomber, H.L.; Ingram, D. pp 43-87 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

The power conditioning and control systems proposed for each of 17 photovoltaic pilot plants are briefly described. The advantages and disadvantages of the various approaches taken by the contractors are discussed, with particular reference to efficiency, reliability and cost-effectiveness. It seems clear that the power conditioning and control systems for all projects have been carefully considered by the contractors involved, albeit with a wide range of conclusions. Some for example have decided to use well-proven commercial inverters with relatively minor modifications to improve efficiency. Others are developing new inverters using the latest high-power transistor devices, which, though not yet proven for these applications, offer higher efficiency. Some contractors are proposing relatively complex overall systems, giving considerable operational flexibility and hence scope for gaining much experience under various conditions. Others have opted for systems as simple as possible for the specific application. Whether the more complex systems will in the long term constitute more reliable generators of electrical power is an important question that can be answered only by experience. There appear to be no reasons for considering any of the projects to be inadequately designed in respect of the power conditioning and control aspects. Many different approaches are being adopted, each logical given the particular circumstances, thereby enhancing the interest and value of the pilot plant programme. Consideration should however be given to ensuring that all plants incorporate data acquisition systems that will facilitate rapid analysis to obtain not only overall performance but also the performance of the principal components such as photovoltaic array, dc-dc converters, dc-ac inverters and batteries.

62869 **Battery systems for energy supply in photovoltaic power plants.** Willmes, H. (Berliner Allee 69, Iserlohn, Germany). pp 88-99 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

Mainly lead-acid batteries are used for applications in photovoltaic power plants. Batteries of the type VARTA bloc are especially suitable with regard to their capacity, the discharge voltages, chargeability, cycle stability, low self-discharge, and freedom from maintenance. The alloy used, with 1.6% antimony, is the reason for the low self-losses and good cycle stability of these batteries. During operation of the photovoltaic plant, the state of charge of the battery is measured and indicated by the VARTA Logistronic. For this purpose, the quantities of charge current and discharge current are registered on Amperehour meters, and transmitted to a microprocessor for further data processing. With the VARTA Logistronic, either power or load management is possible depending upon the state of charge of the battery. Large battery plant, with voltages of more than 220 V, must be located in special, lockable battery rooms. Special care must be taken with regard to adequate ventilation and protection against the effects of acid. The quantity of electrolyte available in VARTA bloc batteries is sufficient for approximately 3 years maintenance-free operation. The intervals be-

tween maintenance can be increased to approximately 15 years, i.e., extended to the lifespan of the battery through the use of recombinator vent plugs on the cells.

62870 **Electrical batteries for energy storage in photovoltaic generation plants.** Thione, L.; Buccianti, R. (CESI, Milano, Italy). pp 100-118 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

A clear and comprehensive picture is given of the problems related to the use of lead acid batteries as storage systems in PV installation, and the necessary knowledge of the battery performance is provided in terms of interpretation of manufacturer data and extension to service condition. To this purpose the main operation requirements are reviewed with special reference to the stand alone operating mode. The parameters characterizing the performance of the battery are illustrated and short mention is made of the impact on these parameters of the principal constructional features. Performances of industrial batteries are outlined, and the behaviour of the storage systems foreseen by the various EC PV-Pilot Projects is discussed at the light of a correct and safe application of manufacturers data. Finally suggestions are given for a test activity to be conducted in parallel to the initial development of the projects, in order to provide further and objective elements for a better estimate of the expectable performances in service.

62871 **Protection against lightning of photovoltaic generation systems.** Thione, L.; Buccianti, R.; Dellera, L. (CESI, Milano, Italy). pp 119-145 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

Elements for the design of lightning protection systems of PV generation plants are provided. The characteristics of lightnings, in terms of probability of occurrence and magnitude and shape of the associated currents, are firstly reviewed; and the characteristics of the protection systems against direct strokes are discussed. The transient surges which may be induced in the plant because of a lightning stroke in the vicinity of the station are then examined. Results of preliminary tests are reported, performed at CESI to verify the capability of the PV modules to withstand the stresses due to these surges. Finally the available data on the protection systems foreseen for the various EC PV Pilot Projects are briefly discussed in the light of criteria and methods presented.

62872 **Recommendations for data monitoring and processing.** Treble, F.C.; Tuebcke, J.M.; Traeder, K. pp 152-163 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

One of the principal aims of the CEC Photovoltaic Pilot Project Programme is to gather information which will lead to the optimization of future photovoltaic systems in terms of performance, reliability and cost. After considering the information required to meet this end, recommendations are made for the instrumentation of the systems, the processing and recording of the monitored data on magnetic tape in a standard format and the presentation of information derived from the recorded data in a form suitable for comparative analysis. An estimate is made of the cost of such a monitoring system. It is recommended that means be provided in every system for the rapid detection and correction of faults and some suggestions are made in this connection. It is also recommended that a log book be kept to record failures, accidents, remedial action, severe weather, maintenance operations, peak power measurements, calibration checks and any changes in array orientation.

62873 **Overview of photovoltaic system maintainability design considerations and maintenance procedures.** Bullock, C.; Macomber, H.L. (MONEGON, Ltd., Gaithersburg, MD). pp 164-176 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

The maintenance requirements of a photovoltaic system can have a significant impact on the life-cycle costs of the system. For this reason, maintainability should be an important consideration in every stage of PV system implementation, including design, manufacture, installation, and operation activities. Major operation and maintenance factors to be considered in the design tradeoff analyses are discussed. These analyses are necessary in designing the array size, battery capacity, the degree of automatic controls and monitoring and the level of redundancy required. Once a PV system has been designed, certain activities are required to maintain the system. These activities consist of preventive and corrective maintenance, and can include the use of troubleshooting guides. An important aspect of maintenance that is often overlooked is proper logistics support, which includes the availability of spare parts, the provision of tools, test equipment, and maintenance aids, and the operation of an appropriate system monitoring program. Finally, a maintenance program requires detailed technical documentation on system operation, inspection and preventive maintenance, and corrective maintenance. Additional documentation is needed on-site for the safe operation of the system, and to provide information to maintenance crews when communicating with off-site technical personnel.

62874 **300 kW photovoltaic pilot plant Pellworm.** Lowalt, H.J. (AEG-Telefunken, Wedel, Germany). pp 179-201 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

The photovoltaic pilot project Pellworm with a peak power of 300 kWp in the flat plate construction will mainly supply the recreation centre of Pellworm in a self sufficient operation mode. The surplus of energy will be fed into the grid. The plant will comprise standard modules with multicrystalline silicon cells glass encapsulated. For testing reasons structures made from steel and wood materials will be installed. Investigations of the soil show that foundation is absolutely necessary. To guarantee the self sufficient operation mode, a battery of 8000 Ah will be installed. To realize an operation as buffer battery and a simultaneous charging, the battery has to be divided in two parts. The grid will be available as back-up energy supply. Energy conversion will be done with one line commutated inverter for the utility board supply and with two self commutated inverters for the self sufficient operation mode of the consumer. The energy demand of the recreation centre with the seasonal dependence will be well matched to the monthly output energy of the photovoltaic plant. Energy transmission to the consumer by a cable way of about 2500 m has to be done by a step up transformer to reduce the cable losses. A system built up with micro computers will act as super imposed control- and monitoring system.

62875 **Vester Boegebjerg photovoltaic power plant.** Funk, J. (Siemens A.G., Erlanger, Germany). pp 202-215 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

The Vester Boegebjerg project will be a pilot plant for stand-alone power supply that means island conditions. A photovoltaic solar generator of 100 kW peak will generate electrical energy from the sun to the little village of Vester Boegebjerg in Denmark. To cover the 3 phase alternating current 220/380 V power demand of the consumers a special system technology has to be developed due to the specific conditions photovoltaic power plants of this kind work on.

62876 **Kythnos photovoltaic power plant.** Ritter, H. (Siemens, A.G., Erlangen, Germany). pp 216-227 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

The Kythnos Photovoltaic Power Plant will be installed on the Greek island Kythnos which is located about 60 km south of

Athenes. The aim of this project is supplying electricity together with the existing diesel power station to the island consumers and saving of high costly fuel oil. A photovoltaic solar generator of 100 kW peak will convert solar energy directly in electrical energy. To feed into the existing island grid with a 3 phase ac system a special system technology has to be developed. This photovoltaic power plant will be designed under the consideration of using a technique for further projects in the future.

62877 **Alicudi Project.** Taschini, A. (ENEL, Milan, Italy). pp 228-247 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

The chief aim of the Alicudi Project is to evaluate the technical and financial feasibility of supplying small isolated communities with electric power, using a photovoltaic solar energy system. The experiment consists in the design, construction, and operation, on a small island in the Aeolian Archipelago, of a plant for the production of electric power by means of a photovoltaic system. The generating unit will consist of a photovoltaic array with flat panels, subdivided into two 40-kWp sections and related storage and power conditioning subsystems. The report describes the general design criteria for the plant and some of its components. Reference is also made to problems connected with assembly of the plant, given the relative inaccessibility of the island and the absence of motor-roads leading to the site.

62878 **Solent project: 80 kilowatts Marchwood power station site.** Scott, R.D.W. (Lucas BP Solar Systems Ltd., Aylesbury, England). pp 248-260 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

It is planned to build a solar generation plant with a peak output of 80 kW on the CEGB Marchwood Power Station site. The power output is to be integrated into the Marchwood site distribution system, either to supplement the power taken from the grid network or to support individual, isolated, selected loads. Experience gained from this demonstration project will assist in the design of future rural electrification and grid linked solar generators. The final designs which are now to be proved during the development phase include a number of novel concepts. The highly redundant modules are to be mounted on a newly designed low cost structure with an easily assembled design incorporating a simple interwiring system. The dc controls facilitate four modes of operation with any combination of battery connected, grid connected and autonomous generation. The inversion subsystem is designed to accommodate these modes at a high overall throughput efficiency. Finally the monitor will provide a comprehensive range of data for instantaneous display and subsequent data analysis.

62879 **Pump station for fresh water supply.** Germano, G. (PRAGMA S.p.A., Rome, Italy). pp 261-275 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

Aim of Photovoltaic Pilot Project Zambelli is to supply the drinking water station Zambelli - nearby Verona - with power generated by a 70 KWp field in order to demonstrate the viability of photovoltaic technology for water pumping industrial uses. Following the general assumptions of the project and the adaptation to local situation, a selection of an optimum configuration of the electrical system is described as a result of comparative analyses in terms of components cost, system performance and reliability. The evaluation includes the use of: dc motors, centrifugal and alternative pumps, selected among the commercially available types, inverters with frequency and voltage modulation and batteries as buffer. A description of the main components of the plant is reported and the system performance is presented in terms of yearly product water and specific energy cost. The accordance with specifications of EEC for subsystems such as dc-dc converter and dc-ac inverter has lead to the selection of ad hoc developed components with high reliability. Project organization is briefly discussed.

62880 **Tremiti desalination plant.** Fonzi, F. (Adriatica component: Elettronic, Sulmana, Italy). pp 276-291 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

The Tremiti Project will assure the drinkable water supply to the Island of S. Nicola in the Adriatic Sea. The system is a stand-alone plant for sea water desalination using the reverse osmosis process, energized by a photovoltaic power plant. An array of p.v. monocrystalline silicon cells will give a 65 kWp nominal peak power. MPPT/MBC converter will feed the main dc bus and the storage battery which assures the uninterrupted operation of the desalination plant during overcast periods. The total plant area is 4000 sq.m; 1800 of them covered by the p.v. field: the layout of the rows of modules has been designed to optimize the efficiency of the array subsystem, to minimize atmospheric overvoltage, and to assure easy operation and maintenance. Good fitting with the natural characteristics of land is obtained. The supporting structure was designed following cost optimization criteria, a multisupport precast concrete stands will be installed. The electric appliance load will consist in ac induction motors driven by single inverters with variable voltage and frequency, directly fed from the dc bus of the power plant. This solution assures the optimum energy utilization and avoids surdimensioning of electronic components. The R.O. plant will produce about 5000 cu.m. of water with an average power requirement of 13 kWh/cu.m. A power flow supervisory system will optimize, in every possible operating condition and system status, the utilization of available energy. A data acquisition system will monitor continuously the system and record the relevant parameters for a delayed analysis of the operational performance.

62881 **Powering of a solar heated swimming pool.** van Gysel, M. (I.D.E., Rochefort, Belgium). pp 292-304 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

The aim of this project is to implement a photovoltaic plant that will supply electric power to satisfy two basic needs. The first is to drive the pumps of a 2.100 m^2 solar thermal system that heats an outdoor swimming pool and the attendant buildings. This need is hourly in phase with PV and will be met with a stand-alone subplant. The other is to energise the evening lighting of the pool. This need is seasonally in phase with PV and will be met by a grid connected, battery aided subplant. The whole system will be based on a modular 10 kW dc/ac interface (6 units total) and on a compatible microprocessor-based management unit.

62882 **Rural electrification in French Guyana.** Aubert, B. (SERI Renault Ingeniere, Bois d'Arcy, France). pp 305-316 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

This project deals with a 35 kW photovoltaic generator for the rural electrification of the area of Kaw an isolated community in the French Overseas Department LA GUYANE. The photovoltaic generator will have to replace two existing diesel generating sets that supply Kaw today. The system consists of: 528 new 66 watt modules from photowatt Int. gathered in 44 panels of 12 modules each. Supporting structures and panel wiring were optimized according to a global approach of the system. A 410 kWh available capacity storage has been selected to ensure the continuous electricity supply throughout the year to the homes of Kaw. Power is delivered at alternating 3 x 380 Volts + Neutral. The high efficiency inverter is a device specially developed by Jeumont Schneider using new transistors and the Pulse Width Modulation technology. Each subsystem is selected according to its reliability and self acting operation which is necessary for the powering of a remote zone. These subsystems (batteries with low self discharge, power conditioning, inverter) as well as the high dc voltage allows this photovoltaic plant to obtain an excellent global energetic efficiency.

62883 Power supply for TV and FM emitters. Coureau, P. (Photowatt International SA, Rueil Malmaison, France). pp 317-330 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

MONT BOUQUET project experiments with the use of a 50 kWp photovoltaic system to power FM and TV emitters of TELEDIFFUSION DE FRANCE which are located in the south of France on a remote mountain near Ales. The emitters are using ac triphased current and will be powered either by the photovoltaic plant while solar power is available, or by the grid during the night and bad weather periods. The load constituted by the emitters will be divided into six separate sub-loads which will be switched on or off on account of the shape of the insolation of the day by the mean of a load adaptator. A battery of low capacity will fix the limits of the input voltage of the 30 kVA PWM inverter while storing excedent of energy coming from the array and not immediately used. A specific charge level controller will regulate the charging mode of the battery by the mean of a multi cut-off system allowing a thin adjustment of the charge. A separate monitoring system will collect meteorological and energetic data so that to notice the operating of the station and calculate the global efficiency.

62884 Nice Airport survey and control system. Coureau, P. (Photowatt International SA, Rueil Malmaison, France). pp 331-342 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

This project proposes to use a photovoltaic power station installed on the roof of the freight building of NICE COTE D'Azur AIRPORT to supply ac current to main apparatus of the NAVAID system. The aim of this equipment is to monitor all the movements of the planes in the sky as well as on drive ways inside the circumference of the airport. No failure is admitted on this power plant so that one of the most important point of this project is its highest level of reliability. The total peak power of the photovoltaic array field is fixed to 50 kWp in order to supply the totality of the 5 kVA needed by the user all along the year, during minimum 6 months. A battery is used to assure the autonomy of the system and to fix the input voltage of a 5 kVA PWM inverter to make the dc/ac conversion. A separate monitoring system will collect meteorological and energetic data so that to notice the operating of the power plant and calculate its global efficiency.

62885 Fotavoltaic Project: a 50 kW photovoltaic system to power a dairy farm on Fota Island, Cork, Ireland. Wrixon, G.T. (National Microelectronics Research Center, Cork, Irland). pp 343-353 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

The 50 kWp photovoltaic installation to be built at Fota Island is described. Its purpose is to supply power to operate a dairy farm whose seasonal power needs are well matched to the available insolation. 2664 modules, each with a nominal output power of 19.2W and consisting of 20 multicrystalline silicon solar cells (10 x 10 cms) connected in series, comprise the array. These modules are divided up into 12 sub-arrays each consisting of 6 parallel strings of 37 modules in series, which can deliver 14.5A at 268V. The sub-arrays are individually switchable to one of two dc bus-bars each connected to a battery of capacity 300 Ah at 268 V. The dairy farm load, which mainly consists of motors, has been divided into 3 parallel circuits each driven by a 10 kVA high efficiency self commutating inverter. The loads are fed, via the inverters, from one battery bus while the other battery bus is charged by the solar array. Switching of the sub-arrays, inverters, loads, etc. is under the control of a microcomputer which will assure optimum operating efficiency of the installation. A 50 kVA line commutated inverter is used to export surplus energy to the utility grid and to provide backup during periods of prolonged low insolation. The modules are mounted in one plane at 45° elevation in 24 rows of 111 modules each. The back and sides of the array are enclosed by a concrete block structure to reduce wind loading.

62886 Solar-wind project Terschelling. Sonneville, R.P.M. (Holecsol Systems B.V., eindhoven, Netherlands). pp 354-373 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

The solar-wind system provides about 95% of the electrical energy of a school for maritime studies. Local weather-circumstances (irradiation and wind) are used to its optimum by applying a photovoltaic solar generator of 50 kWp in combination with a wind generator of 30 kW. The system is connected to the utility-grid to investigate the interaction and to guarantee a completely reliable energy-delivery to the consumer, secondly to increase the use-factor of the system.

62887 Aghia Roumeli electricity supply to an isolated village. Aubert, B. (SERI Renault Ingeniere, Bois d'Arcy, France). pp 374-385 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

The aim of this project is to demonstrate photovoltaic generators as technically suitable, economically achievable and socially well accepted today solutions to meet the energy requirements of remote villages out of reach of utility grids. During spring of 1982, an autonomous 50 kW photovoltaic generator will be installed for all electrical needs of Aghia Roumeli, a small village of 105 inhabitants located on the southwest seashore of the Crete Island. Technological and system development has been devoted to each subsystem: array supporting structures, wiring features, power conditioning equipment, inverter and storage battery. Reliability, cost/efficiency ratio and automaticity were the key design criteria. As a result, this innovative photovoltaic power generator can be viewed as a prototype of future solar gensets that could replace conventional diesel engine for stand-alone electricity supply of isolated communities: The Greek national utility, The Public Power Corporation, will own and maintain the generator and its distribution network for their expected lifetime (20 years).

62888 Water disinfection system and cold store. Germano, G. (PRAGMA S.p.A., Rome, Italy). pp 386-399 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

The plant described includes a combined use of power generated from a 45 KWp PV field: (a) a water disinfection system, that uses a commercial ozonizer for sea desalinated of well or pool pumped water and (b) a cold store unit for food stuffs conservation. The design concepts for an optimum utilization of solar energy are discussed and the selected solutions presented. As regards the water disinfection system particular care has been devoted to the control of critical process parameters. For the cold store system, an optimization has been performed for the operation of dc motor compressor which uses a combined motor speed and cylinders loading control, according to available insolation. The use of eutectic plates and natural heat convection instead of a conventional ice bank allows a reduction in auxiliaries consumption and a better uniformity in cell temperature.

62889 Revitalisation D'UN village corse. Mercier, D. (Leroy-Somer, angulene, France). pp 401-417 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

The PAOMIA project is a stand alone photovoltaic plant installed in a remote area in Corsica to power a hamlet. The hamlet is now losing its inhabitants due to the lack of electric power and it is expected that the actual population will stay here and that new people will come back. The plant will feed the houses, the public

lighting, a water pump, an ewes milkery and a small cottage industry workshop. The plant consists of a 44,064 Wp solar array installed nearby the village. The power management includes a 50 kVa triphase PWM inverter, a 540 kWh storage, a charge regulation and control and measurement apparatus. A generating set is provided as a back-up to give a total security of the electric production even in the worst winter seasons.

62890 **Photovoltaic powerplant for hydrogen production and waterpumping.** Bertels, G. (E.N.I., Aartsedaar, Belgium). pp 418-423 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

The main purpose of this project is production of hydrogen by water electrolysis, directly using the power delivered by a 30 kW-photovoltaic array. Power production exceeding the 10 kW-rating of the electrolyser unit, will be used for waterpumping: two centrifugal pumps are driven by 7.5 kW direct current motors, also directly connected to the array busbars, without power conditioning unit. The hydrogen will be used in the industrial processes of a non-ferrous metallurgic plant, and the pumps will concur to the supply of a 3 bars water distribution network.

62891 **Adrano Project.** Taschini, A. (ENEL, Milan, Italy). pp 424-429 of Photovoltaic power generation. Palz, W. (ed.). Dordrecht, Netherlands; D. Reidel Publishing Company (1982).

From Final design review meeting on EC photovoltaic pilot projects; Brussels, Belgium (30 Nov 1981).

The aim of the Adrano Photovoltaic Project is to permit direct on site testing and comparison of different P.V. plants suitable for supplying electric energy to the grid. The Project will include the design, fabrication, installation and testing of six 5 kW/sub p/ blocks, representing four different types of flat-plate modules and two different types of concentrator modules. The six blocks will be located in Sicily, close to the Eurelios 1 MW central receiver power plant; this will make it possible to compare the performance of different systems. The generated power will be directly fed into the local 50 Hz electric network. Each block consists of the array (P.V. modules, support structures, wiring, connectors, protection devices), the power conditioning system (inverter) and possible instrumentation, control and display. Therefore each block shall be a fully independent P.V. system able to supply electric energy to a 380 V, 50 Hz three-phase line. All electrical, thermal and meteorological data affecting the operation of the blocks will be recorded by a dedicated data acquisition system.

1407 Solar Thermal Power Systems

REFER ALSO TO CITATION(S) 62903, 62904, 62905, 62906, 62907, 62913

62892 **(DOE/JPL—1060-55) Solar-thermal technologies benefits assessment: objectives, methodologies, and results for 1981.** Gates, W.R. (Jet Propulsion Lab., Pasadena, CA (USA)). Jul 1982. Contract AM04-80AL13137. 44p. (JPL-PUBL—82-70). NTIS, PC A03/MF A01. Order Number DE83000475.

The future economic and social benefits of developing cost-competitive solar thermal technologies (STT) were assessed during FY 81. The analysis was restricted to STT in electric applications for 16 high-insolation/high-energy-price states. Three fuel price scenarios and three 1990 STT system costs were considered, reflecting uncertainty over future fuel prices and STT cost projections. After considering the numerous benefits of introducing STT into the energy market, three primary benefits were identified and evaluated: (1) direct energy cost savings were estimated to range from zero to $50 billion; (2) oil imports may be reduced by up to 9 percent, improving national security; (3) significant environmental benefits can be realized in air basins where electric power plant emissions create substantial air pollution problems. STT R & D was found to be unacceptably risky for private industry in the absence of federal support. The normal risks associated with investments in R & D are accentuated because the OPEC cartel can artificially manipulate oil prices and undercut the growth of alternative energy sources. When this fact was weighed against the potential benefits of developing cost-competitive STT, Federal participation in STT R & D was found to be in the national interest.

62893 **(SERI/TP—252-1684) Advanced, high-temperature molten-salt storage.** Copeland, R.J. (Solar Energy Research Inst., Golden, CO (USA)). Aug 1982. Contract AC02-77CH00178. 8p. (CONF-820827—23). NTIS, PC A02/MF A01. Order Number DE82020852.

From Energy storage contractors review meeting; Arlington, VA, USA (23 Aug 1982).

Advanced molten salts (hydroxides, carbonates, and chlorides) are being researched for solar thermal applications. These salts may be used in both the receiver working fluid and in thermal energy storage. Potential applications include electric power production, fuel and chemical production, and high-temperature process heat. Molten salts can store sensible heat at temperatures up to 1100°C in a thermocline system with a unique insulating platform (raft) that floats between the hot and cold molten salts. Overall solar thermal and thermal storage systems are described, and also the economic potential of the systems is assessed. In current research, the performance of insulating raft thermocline is being tested and materials compatibility is being studied.

62894 **(SERI/TR—631-1122R) Organic Rankine cycle coupled to a solar pond by direct-contact heat exchange - selection of a working fluid.** Wright, J.D. (Solar Energy Research Inst., Golden, CO (USA)). Jun 1982. Contract AC02-77CH00178. 36p. NTIS, PC A03/MF A01. Order Number DE82020998.

Heat from a solar pond may be used to drive an organic Rankine cycle and produce electricity. Due to the inherent low efficiency of low-temperature cycles, large amounts of heat must be transferred, and heat exchangers may account for up to 50% of the plant cost. Use of a direct-contact boiler, in which the organic fluid is bubbled through a stream of pond brine, may reduce the plant cost by about 25%. The choice of a working fluid affects plant efficiency, turbine cost, and the loss rate of the organic fluid. Low-vapor-pressure fluids maximize cycle efficiency by minimizing pumping requirements, but require a larger turbine. Because efficiency affects the size and cost of the entire plant, low-pressure fluids are preferred. Both the saturated and halogenated hydrocarbons were evaluated for use as working fluids. Pentane was the working fluid best suited to this application, because it showed high efficiency, low solubility in the pond, and a reasonable turbine cost.

1408 Ocean Thermal Gradient And Salinity Gradient Power Systems

62895 **(DOE/NBM—1043-Vol.2) Physical, chemical, and biological measurements off Puerto Rico. Appendices.** Vargo, S.; Fanning, K.; Hopkins, T.; Michel, H.; Vargo, G.; Hartwig, E.; Jones, A. (Florida State Univ., St. Petersburg (USA). Inst. of Oceanography; University of South Florida, St. Petersburg (USA); Miami Univ., FL (USA). Rosenstiel School of Marine and Atmospheric Sciences; Lawrence Berkeley Lab., CA (USA)). 30 Oct 1981. Contract W-7405-ENG-48. 449p. NTIS, PC A19/MF A01. Order Number DE82021295.

Portions of document are illegible.

Physical, chemical, and biological data are tabulated for three quarterly cruises to the PROTEC Benchmark site off the southeast coast of Puerto Rico at approximately 17°57′N and 65°48′W. Physical data include temperature, conductivity, and salinity. Chemical data include dissolved oxygen and various nutrients. Biological measurements include phytoplankton, zooplankton, micronekton, and fish, mammal and bird sightings. (LEW)

1409 Solar Thermal Utilization

REFER ALSO TO CITATION(S) 62821, 63160, 63164, 63177

62896 **(DFE—44) Solar heat research. An evaluation of the government program.** Broms, B.; Engstroem, C.-J.; Norbaeck, K.; Nyberg, L.; Nordfeldt, G.; Olsson, S.; Ottosson, H.; Wettermark, G.; Oesterlind, B. (Delegationen foer Energiforskning, Stockholm (Sweden)). Oct 1981. 420p. (In Swedish). NTIS (US Sales Only), PC A18/MF A01. Order Number DE82750062.

A review of the state-of-the-art of solar space heating is given R and D projects in Sweden and some other countries are examined. Recommendations are given for the future research programs. The prospects for different systems (individual houses, groups of houses, district heating and varying storage capacities) are evaluated. It is noted that most solar heating systems are not yet economically competitive and that solar heating R and D need to be publicly financed for another 5-10 years.

62897 **(DOE/CS/30373—T1) Thermal-performance analysis and design for a prototype mobile home, Phase 1. Final report.** Faunce, S.F. (Delaware Univ., Newark (USA). Inst. of Energy Conversion). 1981. Contract FC02-80CS30373. 109p. NTIS, PC A06/MF A01. Order Number DE82021607.

Portions of document are illegible.

The objective of the project is to redesign a popular standard mobile home in order to incorporate passive solar architectural features which will make the house more energy efficient and still affordable. An analysis of the thermal performance of various designs that were considered is presented. The design effort focused on a choice between a design with a clerestory and a design without one. Various factors considered for minimizing the auxiliary energy input and incorporating solar energy are listed and individually discussed briefly. The design factors that were considered in the analysis of the various options are then covered in detail, including: effect of daily outside temperature swings due to climate, orientation effects on heating and cooling, reflective effect of snow and aluminum roofing, optimum number of glazings and night time insulation, direct gain windows, analysis of a configuration with a water wall, minimum allowed infiltration, maximum stagnation temperature of the thermal wall panel, climatic design data, thin wall and/or floor mass thermal storage, heat loss through walls and windows with fuel oil as a cost basis, and energy reference costs. Analyses were based on weather conditions in Louisville, KY and Newark, DE. (LEW)

62898 **(DOE/CS/30526—T1) One Design: Omnibus Thermal Storage Modular System. Final report.** (One Design, Inc., Winchester, VA (USA)). Nov 1981. Contract FC02-80CS30526. 239p. NTIS, PC A11/MF A01. Order Number DE82020748.

Portions of document are illegible.

The design concept is to develop an omnibus or universal modular system which, in its basic form or with simple modifications or attachments, will satisfy all of the needs of eleven market applications. This system has been successfully developed into 3 omnibus modules which satisfy the requirements of 11 markets. Product design criteria formulation, candidate product designs, and prototype fabrication and testing, a field engineering plan, thermal analysis, structural analysis, and material analysis are covered.

62899 **(DOE/CS/30527—T1) One Design Waterwall engineering field test. Final report. Draft.** (One Design, Inc., Winchester, VA (USA)). Oct 1981. Contract FC02-80CS30527. 463p. NTIS (US Sales Only). Order Number DE82020288.

Portions of document are illegible.

The three most promising thermal mass designs are the subject of this field engineering work. The following are covered: basic customer and building code needs, production line design, prototype fabrication, structural engineering and testing, code compliance, field testing prospects, competitive product evaluation, field test installations, thermal performance testing, economic benefits analysis, overall product marketability, and commercialization plan.

62900 **(DOE/ET/20087—2) Data acquisition on Solar One. Final report. Volume I. Executive summary.** (Delaware Univ., Newark (USA). Inst. of Energy Conversion). 1977. Contract AC02-76ET20087. 367p. NTIS, PC A16/MF A01. Order Number DE82008816.

Portions of document are illegible.

The Solar One data acquisition system has been operated and a data base of computer tapes has been generated. Analysis of this data indicates that much of the information gathered is useful in evaluating the performance of solar thermal systems and components in the Delaware region. System documentation is presented and recommendations for improvement are made. There is a need to further refine and simplify the data base and to develop more efficient real time data reduction and analysis methods in order to maximize the value of the large mass of data being collected.

62901 **(GAO/EMD—82-74) DOD should give more consideration to passive-solar systems for new military family housing.** (General Accounting Office, Washington, DC (USA). Energy and Minerals Div.). 17 May 1982. 12p. General Accounting Office, PO Box 6015, Gaithersburg, MD 20760.

It is found that the Department of Defense (DOD) was making limited use of active and passive solar systems in its military family housing units. After DOD evaluated the potential for using various configurations of active systems, it generally found such systems uneconomical. However, it did not give equal or adequate consideration to passive solar systems. It had not established a policy nor provided guidance to the military services concerning passive solar. As a result, detailed evaluations for passive systems were not routinely made. Although Department of Energy studies and demonstrations indicate that many passive solar features are economical for the private sector, DOD remains unconvinced that those features would be economical for military family housing units. Recommendations are made which should help ensure that passive solar systems are adequately considered and included on new military family housing units where economical.

62902 **(LA—9474-PR) Solar-energy research at Los Alamos. Progress report, October 1, 1981-March 31, 1982.** Reisfeld, S.K.; Neeper, D.A. (comps.). (Los Alamos National Lab., NM (USA)). Sep 1982. Contract W-7405-ENG-36. 42p. NTIS, PC A03/MF A01. Order Number DE83000464.

Solar energy research for the period October 1, 1981 through March 31, 1982 by the Los Alamos National Laboratory's Solar Energy Group is described. Work in the area of materials includes chemical conversion coatings, exposure testing of materials, and evaluation of fluid from collector-corrosion test loops. Additional active solar investigation includes projects of the Solar Federal Buildings Program and final results of the sewage sludge-drying project. Salt gradient solar pond laboratory research into predicting interface behavior is recounted in addition to a presentation of calculations from our numerical computer model. Also described is progress on the Passive Solar Heating Analysis manual, on a new passive design manual for the US Navy, on Class A performance evaluation, and on evaporative cooling potential for office buildings. Technical support to the Office of Solar Heat Technologies, US Department of Energy, is also described.

62903 **(NTISUB/A/024—75/001) Solar thermal energy utilization. Quarterly update, January-March 1975.** (New Mexico Univ., Albuquerque (USA). Technology Application Center). Jan 1976. 232p. (TAC/ST—75-602). NTIS.

This annotated bibliography covers the following subjects: development; solar and atmospheric radiation; selected material properties; components, including: flat plate collectors, concentrating collectors, thermal storage, heat exchangers, coolers, heat pumps, solar ponds, and greenhouses; space heating and cooling; process heat; and power generation. (MHR)

62904 **(NTISUB/A/024—75-003) Solar thermal energy utilization. Quarterly update, July-September 1975.** (New Mexico Univ., Albuquerque (USA). Technology Application Center). Jun 1976. 133p. (TAC/ST—75-604). NTIS.

This annotated bibliography covers the following subjects: development; solar and atmospheric radiation; selected material properties; components including: flat plate collectors, concentrating collectors, thermal storage, heat exchangers, coolers, heat pumps, solar ponds, and greenhouses, space heating and cooling; process heat; and power generators. (MHR)

62905 **(NTISUB/A/024—75/004) Solar thermal energy utilization. Quarterly update, October-December 1975.** (New Mexico Univ., Albuquerque (USA). Technology Application Center). Aug 1976. 319p. (TAC/ST—75-605). NTIS.

This annotated bibliography covers the following subjects: development; solar and atmospheric radiation; selected material properties; components, including: flat plate collectors, concentrating collectors, thermal storage, heat exchangers, coolers, heat pumps, solar ponds, and greenhouses; space heating and cooling; process heat; and power generators. (MHR)

62906 **(NTISUB/B/024—76/001) Solar thermal energy utilization. Quarterly update, January-March 1976.** (New Mexico Univ., Albuquerque (USA). Technology Application Center). Mar 1976. 276p. (TAC/ST—76-606). NTIS.

This annotated bibliography covers the following subjects: development; solar and atmospheric radiation; selected material properties; components, including: flat plate collectors, concentrating collectors, thermal storage, heat exchangers, coolers, heat pumps, solar ponds, and greenhouses, space heating and cooling; process heat, and power generators. (MHR)

62907 **(NTISUB/B/024—76/002) Solar thermal energy utilization. Quarterly update, April-June 1976.** (New Mexico Univ., Albuquerque (USA). Technology Application Center). Feb 1977. 209p. (TAC/ST—76-607). NTIS.

This annotated bibliography covers the following subjects: development; solar and atmospheric radiation; selected material properties; components, including: flat plate collectors, concentrating collectors, thermal storage, heat exchangers, coolers, heat pumps, solar ponds, and greenhouses; space heating and cooling; process heat; and power generators. (MHR)

62908 **(NZERDC-P—9) Solar Plans and Sections.** Stevens, D.G. (New Zealand Energy Research and Development Committee, Auckland). Feb 1979. 44p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE82904645.

A Solar Plan is a graduated circle which shows the direction of a shadow cast horizontally by the sun for each daylight hour. Solar Plans are used to design the shape and position of vertical sunshades (fins), to position windows laterally, and to assess sun penetration in a plan. A Solar Section is a rectangular frame graduated around the sides and base in degrees which shows the direction of a shadow cast vertically by the sun for each daylight hour. Solar Sections are used to design the shape and position of horizontal sunshades, to position windows vertically, and to assess sun penetration in elevation. The Solar Plans and Sections are presented in sets for each of the four main urban areas of New Zealand, each set containing charts for winter, equinox, and summer. (LEW)

62909 **(SERI/TP—254-1682) Measured passive-solar performance from new residences in Denver, Colorado.** Swisher, J.N. (Solar Energy Research Inst., Golden, CO (USA)). Aug 1982. Contract AC02-77CH00178. 23p. (CONF-820849—6). NTIS, PC A02/MF A01. Order Number DE82022076.

From Summer study in energy efficient buildings; Santa Cruz, CA, USA (22 Aug 1982).

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Discussed is the thermal performance of twelve passive solar residences in the Denver, Colorado, metropolitan area. These buildings were monitored during the 1981 to 1982 heating season as part of the Residential Class B Passive Solar Performance Monitoring Program. A low-cost approach to building thermal monitoring is explained, including the instrumentation hardware, the real-time data reduction program, and the performance evaluation methodology. The buildings are described in detail, with monthly and seasonal summaries of weather data and the basic building energy flows. Future detailed analysis efforts, using hourly data, are discussed briefly.

62910 **(DOE/R5/10137—T1) Active assist for sub-tempered dwelling. Final technical report.** Berggren, B. (Berggren (Brian), Inver Grove Heights, MN (USA)). [nd]. Contract FG02-79R510137. 12p. NTIS, PC A02/MF A01. Order Number DE82019438.

The design and performance are briefly described of an active and passive solar heating system and a grey water system serving a house in Minnesota. The active system was designed to provide supplemental heat when temperatures were coldest and cloudy days common. It included eight flat plate collectors coupled to a 3000 gallon storage tank. The active system has not provided heat to the structure. The storage tank developed a leak shortly after system checkout. The passive system is direct gain incorporating 400 ft^2 of south glazing, less than 20 ft^2 on the north, and no glazing on the east or west. Heat is stored in thermal mass. It provides a comfortable, efficient, and bright space, and had a solar fraction of 49%. The grey water system was not installed. The house was found to be draft-free, with coldness apparent only at the north windows. (LEW)

1410 Solar Collectors And Concentrators

REFER ALSO TO CITATION(S) 62894, 62902, 62903, 62904, 62905, 62906, 62907

62911 **(DTH-LV-MEDD—110) Testing stand for solar heating system. Results of the first project on the testing stand.** Balslev Olesen, O.; Nielsen, C. (Danmarks Tekniske Hoejskole, Lyngby). 1981. 53p. (In Danish). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750053.

A solar collector storage tank, which will be of interest for future projects within solar heating systems for space heating incorporating domestic hot water, has been tested in this project. The test has given a thorough knowledge of how to develope a storage tank with the greatest effect. The sensitivity of the system has also been tested by parameter variations. It has been carried out by the computer program verified in the project. These parameter analysis decide the "improvements" in a solar heating system which will give the greatest surplus effect. The model can also be used for economical considerations regarding improvement of the profitability of solar heating systems. In this project a solar collector with a black painted absorber has been used. Other projects have shown that the increased expenses by using selective surfaces are more than compensated by the surplus effect of the solar collector. The same facts manifest themselves in this combined system. Selective solar collectors have been placed on the test bed, and a storage tank giving a simple system solution has been used. That may be this new project is a prototype of a 2nd generation demonstration system. The 2nd generation system will be built in The Energy Ministry's Solar Heating Program ultimo 1982.

62912 **(Juel-Spez—90) Influence of meteorological parameters on the stagnation temperature of thermal flat plate collectors.** Massmeyer, K. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Kernphysik). Sep 1980. 100p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82750613.

For the safe operation of collector systems an assessment of maximum temperature in a collector is required. Per convention (DIN standard 4757) this temperature occurs at solar insolation of 1000 W/m^2 at a screen temperature of 32°C and at wind speed of m/s, when the collector under no flow condition has reached thermal equilibrium. A method was developed to evaluate this maximum stagnation temperature at any meteorological condition. The maximum stagnation temperature of the investigated single pane flat plate collector is equal to 155°C +- 5°C. The dependence of the stagnation temperature of a flat plate collector upon meteorological parameters as solar insolation, screen temperature, wind speed, diffuse part of global radiation, and atmospheric thermal radiation was investigated. Besides the solar insolation the variation of the stagnation temperature is mainly affected by the wind speed and screen

temperature. The meteorological measurements at the collector test stand allowed the computation of daily cycles of the terms of the energy balance equation of the earth's surface. These evaluations were carried out for three days with different cloudiness using the Sverdrup-method.

62913 **(LBL—13755) Design and construction of a high-temperature gas receiver utilizing small particles as the heat exchanger (SPHER). Phase I report.** Hunt, A.J.; Evans, D.B. (Lawrence Berkeley Lab., CA (USA)). 1981. Contract AC03-81SF11492. 69p. NTIS, PC A04/MF A01. Order Number DE83000047.

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The Small Particle Heat Exchange Receiver (SPHER) operates by injecting a very small mass of ultrafine carbon particles into a gas stream and exposing the suspension to sunlight that is focused through a window. The particles absorb the sunlight and act as very efficient heat exchangers to transfer the heat to the gas. The particles continue to heat until they react chemically or vaporize. The principles, design philosophy, and construction of a SPHER receiver are described. The system consists of two major components, the particle generator and the receiver. Analytical work is presented on optical properties and thermal properties of small particle suspensions and on particle production and oxidation. Also described is the instrumentation to monitor the operation of the particle generator and receiver. All major subsystems were built and most have undergone laboratory check out. Particle generator test results are described. Appended is a paper on the performance analysis of a SPHER. (LEW)

62914 **(SAND—81-7037) Development effort on sheet-molding compound (SMC) parabolic-trough panels.** Kirsch, P.A. (Sandia National Labs., Albuquerque, NM (USA); Budd Co., Fort Washington, PA (USA). Technical Center). Jul 1982. Contract AC04-76DP00789. 103p. NTIS, PC A06/MF A01. Order Number DE83000392.

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The approach taken to develop integrally molded reflective glass with sheet molding compound into parabolic trough solar reflectors is described in detail. Results indicate that mirrored glass sheets, if properly strengthened to withstand the temperature and pressure of the molding process, can be successfully molded with sheet molding compound in a single press stroke using standard compression molding techniques. The silver reflective surface must be coated with an adhesive mixture that provides both protection of the silver and adhesion to the sheet molding compound. The sheet molding compound must provide the strength and stiffness required of a structure backing material. (LEW)

62915 **(SERI/TP—253-1667) Truscott Brine Lake solar-pond system conceptual design.** Leboeuf, C.M.; May, E.K. (Solar Energy Research Inst., Golden, CO (USA)). Aug 1982. Contract AC02-77CH00178. 7p. (CONF-821101—10). D. Order Number DE82020923.

From ASME winter annual meeting; Pheonix, AZ, USA (14 Nov 1982).

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Discussed is a conceptual design study for a system of electricity-producing salt-gradient solar ponds that will provide power to a chloride control project under construction near Truscott, Tex. The chloride control project comprises a 1200-ha (3000-acre) brine impoundment lake to which brine will be pumped from several salty sources in the Wichita River basin. The solar ponds are formed by natural evaporation of the briny water pumped to Truscott. Heat is extracted from the solar ponds and used to drive organic Rankine-cycle (ORC) generators. Ponds were sized to provide the pumping needs of the chloride control project and the maintenance requirements of the solar ponds. The system includes six solar pond modules for a total area of 63.1 ha, and produces 1290 kW of base load electricity. Although sized for continuous power production, alternative operating scenarios involving production of peak power for shorter durations were also examined.

62916 **Solar selective molybdenum-black films by cathodic electro-deposition.** Potdar, H.S.; Hegde, R.I.; Badrinarayan, S.; Pavaskar, N. (National Chemical Lab., Pune, India). *Solar Energy Materials;* 6: No. 2, 183-190(Jan 1982).

Solar selective molybdenum-black films have been prepared on various substrates by a cathodic electro-deposition technique. These films are adherent and non-crystalline in nature and consist essentially of MoO_3. The films on nickel plated copper substrates have $\alpha \approx 0.85$ and $\epsilon \approx 0.11$.

62917 **Solar absorptance and thermal emittance of Al_2O_3 films on Al: a theoretical assessment.** Eriksson, T.S.; Hjortsberg, A.; Granqvist, C.G. (Chalmers Univ. of Tech., Gothenburg, Sweden). *Solar Energy Materials;* 6: No. 2, 191-199(Jan 1982).

We compute solar absorptance and thermal emittance for Al_2O_3 films on Al by use of our previous determination of the dielectric function for evaporated Al_2O_3. The solar absorptance is $\approx$ 0.13 for films thicker than 0.4 μm. Low thermal emittance, suitable for solar thermal conversion, requires film thicknesses lower than 0.8 μm, whereas rather high emittance can be obtained for films thicker than 3 μm. Our theoretical results are consistent with published experimental data.

62918 **Comparison of stannous and stannic chloride as sensitizing agents in the electroless deposition of silver on glass using x-ray photoelectron spectroscopy.** Pederson, L.R. (Pacific Northwest Lab., Richland, WA). *Solar Energy Materials;* 6: No. 2, 221-232(Jan 1982). Contract AC06-76RL01830.

The effectiveness of $SnCl_2$ and $SnCl_4$ in the sensitization of soda lime silicate glass for silver mirror production was investigated using XPS. Precleaned glasses treated with 2.5×10^{-3} M solutions of either $SnCl_2$ or $SnCl_4$ showed similar levels of tin uptake (3 to 5 at %) that could not be removed by extensive rinsing in distilled water. Oxidation states of the bound tin were not easily distinguished by XPS measurements, however, their chemical reactivities were quite dissimilar. Upon exposure of the sensitized glass surfaces to ammoniacal silver nitrate, approximately two silver atoms became attached per surface tin atom for the $SnCl_2$-treated specimens. In contrast, most of the tin was lost from the $SnCl_4$-treated glass surfaces after identical treatment. Approximately one silver atom became bound per remaining three tin atoms in the latter case. Auger parameter data indicated that the ionic character of the silver-tin bond was greater than that of metallic silver but less than that of the silver-oxygen bond in either silver oxide or ion-exchanged silver in the glass. An oxidation-reduction mechanism is proposed for the sensitization reaction of silver with surface stannous ions that is consistent with XPS results.

1420 Heat Storage

REFER ALSO TO CITATION(S) 62893, 62903, 62904, 62905, 62906, 62907, 62911

62919 **(BMFT-FB-T—82-016) Latent heat thermal energy storage - determination of properties of storage media and development of a new heat transfer system.** Abhat, A.; Aboul-Enein, S.; Malatidis, N.A. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Jan 1982. 193p. (In German). NTIS (US Sales Only), PC A09/MF A01. Order Number DE82750498.

Development of a latent heat storage system for low temperature solar heating applications is described. Latent heat storage materials are investigated and a new heat exchanger concept is proposed and evaluated. Calorimetric measurements of thermophysical properties of 14 organic and inorganic heat storage materials, including 5 inexpensive commercial paraffins, 2 fatty acids and 5 salt hydrates, are performed with a precision differential scanning scalorimeter. The frequently needed, but often missing, data pertaining to the phase transition temperature and enthalpy, as well as the specific heat of the heat storage materials in the solid and liquid phases of the substance are measured. The influence of thermal cycling on the melting and freezing behavior of the materials and on any changes in the thermophysical properties is studied. A heat exchanger concept employing finned-annulus heat exchanger elements is investigated. Development of a heat exchanger element using a numerical analysis and an experimental program is reported. The tests were performed using two laboratory models that employed a

paraffin, two fatty acids and one salt hydrate as heat storage materials. Experimental results indicate the thermal performance to be adequate for eventual use of the heat exchanger concept in larger heat stores for low temperature solar heating applications. A cost analysis for the use of the latent heat storage concept in a domestic hot water and a combined space heating/domestic hot water application is included.

62920 **(DTH-LV-MEDD—97) Testing of heat storage units for solar heating systems.** Furbo, S. (Danmarks Tekniske Hoejskole, Lyngby). Apr 1980. 92p. (In Danish). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82750054.

Heat storage units supplied by various solar-collector producers were tested for their thermotechnical parameters as stores for hot water. The testing procedure is described. For every heat storage unit the following conditions are tested: heat loss coefficient of the unit with operating solar collector, cooling process during periods without heating nor heat use, heat storage unit thermal capacity, heat transfer from solar-collector liquid to heat store in various storage temperature. Improvements are proposed, experience achieved through testing discussed.

62921 **(NP—27500XX) Heat losses from large heat stores.** Nordgaard Hansen, P. (Danmarks Tekniske Hoejskole, Lyngby). Mar 1979. 49p. (In Danish). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750060.

Long-time storage of heat in ground or water stores is investigated for the prospective solar heating of space and water. In Danish climate there is required solar heat storage in 4-6 months. Mathematical models describe the total heat capacity, solutions are given for one-dimensional plate case, for spherical case, temperature profiles and accumulated heat losses. Heat transport through the ground and insulation against heat losses are evaluated.

62922 **(SERI/TP—231-1660) SERI solar-energy-storage program in FY 1982.** Luft, W. (Solar Energy Research Inst., Golden, CO (USA)). Jul 1982. Contract AC02-77CH00178. 6p. (CONF-820827—2). NTIS, PC A02/MF A01. Order Number DE82018306.

From Energy storage contractors review meeting; Arlington, VA, USA (23 Aug 1982).

The SERI solar-energy-storage program in FY 1982 is summarized against the background of earlier years and the broader program of the DOE Division of Energy Storage Technology. The program provides research, systems analyses, and assessments of thermal and thermochemical storage and transport, primarily in support of the DOE joint development plan for thermal energy storage for solar thermal applications (TESSTA). Current activities include recommendations for the development of promising storage concepts for specified solar thermal power and process heat systems, in-house and subcontracted explorations of advanced concepts, and assessments of long distance solar thermal energy transport concepts.

15 GEOTHERMAL ENERGY

62923 **(DOE/ET/27155—1) Design for an information-management system.** (Sonoma State Univ., Rohnert Park, CA (USA). Ruben Salazar Library). 8 Mar 1979. Contract FG03-78ET27155. 26p. NTIS (US Sales Only). Order Number DE82020977.

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The design of an information management system to assemble, classify, and catalog existing documentation on the development of the Geysers/Calistoga Known Geothermal Resources Area (KGRA) is presented. The study consisted of several components: user need requirements, design of the system, survey of information management systems, and systems analysis and cost proposal. User input concerning information requirements and system characteristics were obtained from interviews (personal and telephone) and a questionnaire. The sample user population expressed a need for the identification and access to relevant information concerning local geothermal development. Furthermore, it was a consensus of opinion that the creation of an information center as a depository for relevant documentation would be useful in meeting information needs. The production of a book catalog utilizing automatic data processing (ADP) and a data base management system (DBMS) approach is proposed. The catalog would contain full bibliographic descriptions for all records as well as abstracts for highly significant documents.

1501 Resource Status And Assessment

REFER ALSO TO CITATION(S) 62927, 62928, 62936

62924 **(DOE/ID/12030—T2) Evaluation of hydrothermal resources of North Dakota. Phase II. Final technical report.** Harris, K.L.; Howell, F.L.; Winczewski, L.M.; Wartman, B.L.; Umphrey, H.R.; Anderson, S.B. (North Dakota Univ., Grand Forks (USA). Engineering Experiment Station). 1 Jun 1981. Contract FC07-79ID12030. 319p. NTIS, PC A14/MF A01. Order Number DE82020766.

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This evaluation of the hydrothermal resources of North Dakota is based on existing data on file with the North Dakota Geological Survey (NDGS) and other state and federal agencies, and field and laboratory studies conducted. The principal sources of data used during the Phase II study were WELLFILE, the computer library of oil and gas well data developed during the Phase I study, and WATERCAT, a computer library system of water well data assembled during the Phase II study. A field survey of the shallow geothermal gradients present in selected groundwater observation holes was conducted. Laboratory determinations of the thermal conductivity of core samples is being done to facilitate heat-flow calculations on those hole-of-convenience cased.

62925 **(DOE/NV/10177—2) Multiple-task services for the Department of Energy's hydrothermal resources program. Final report, November 1980-August 1982.** (Gruy Petroleum Technology, Inc., Arlington, VA (USA)). Nov 1982. Contract AC08-81NV10177. 19p. NTIS, PC A02/MF A01. Order Number DE82020997.

The assignments under the task to define the geothermal resource potential in the eastern United States consist of the following subtasks: geothermal resource characterization; state-coupled liason; low-temperature geothermal assessment; user-coupled confirmation drilling program; ASTM geothermal coordination; and topical studies. The technical assistance assignments consist of information dissemination; geothermal reservoir engineering; and technical assistance to geothermal users. Activities under these tasks are summarized. (LS)

1502 Geology And Hydrology Of Geothermal Systems

REFER ALSO TO CITATION(S) 62932

62926 **(DOE/ER/10973—T1) Implications of fission-track annealing for geothermal models in the Pacific Northwest. Technical progress report.** Blackwell, D.D.; Duncan, I.J. (Southern Methodist Univ., Dallas, TX (USA)). 21 May 1982. Contract AC03-81ER10973. 19p. NTIS, PC A02/MF A01. Order Number DE82017169.

A fission-track dating lab has been set up. Samples have been obtained from fossil and active geothermal systems and are in the process of being separated, counted and dated with subsequent modeling planned. The thermal model of horizontal flow in a geothermal aquifer is being prepared. Modeling of magma systems and regional thermal evolution has been confined to studies of the Rio Grande Rift and the deep holes at the Fenton Hill Dry Hot Rock locality at the edge of the Valles caldera. Samples have been obtained from one deep hole in a sedimentary basin, the western Snake River basin in eastern Oregon. These samples are being separated so that the fission-track annealing can be studied. Studies of the systematics of fission-track fading are in progress. Several models have been investigated to explain the existing fission-track fading data, and several annealing experiments are planned. The use of transmission electron microscopy (TEM) for direct observation of fission-track fading has been investigated. (LEW)

62927 (DOE/ID/12009—T2) Geothermal-resource potential for a portion of the San Pedro River Valley. Hahman, W.R. Sr. (Arizona Bureau of Geology and Mineral Technology, Tucson (USA). Geothermal Group). 1981. Contract FC07-79ID12009. 60p. NTIS, PC A04/MF A01. Order Number DE82021852.

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Three anomalous areas containing shallow-depth warm water have been located in the San Pedro study area: (1) the San Manuel-Mammoth area; (2) the A.C. Gruwell Ranch; (3) Hookers Hot Springs at the Muleshoe Ranch. The probable explanation for these warm water resources is as follows. The Galiuro Mountains, the remains of a volcanic pile deposited along the axis of a large synform (Rehrig and Heidrick, 1976), are in all probability an area of recharge for the ground water system in the area. The meteoric water falling down upon the Galiuro Mountains percolates downward to great depths through fractures in the volcanic rocks, becomes heated, rises by convection along faults, encounters late Tertiary sedimentary units overlying these faults and migrates laterally through these sediments out into the basin. These warm waters are now near the surface because of erosion of the late Tertiary and Quaternary sedimentary units by the San Pedro River. This type of phenomenon will readily explain the unreasonably high gradients encountered in some of the more shallow wells. This low- to moderate-temperature geothermal resource may be utilized using current heat-pump technology for space heating and cooling, green house operations or in health spas. However, the size and production capabilities of the reservoir has yet to be established.

62928 (DOE/ID/12009—T3) Preliminary assessment of the geothermal resource potential of the Yuma area, Arizona. Stone, C. (Arizona Bureau of Geology and Mineral Technology, Tucson (USA). Geothermal Group). 1981. Contract FC07-79ID12009. 27p. NTIS, PC A03/MF A01. Order Number DE82021571.

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The Yuma area has had a long and complex tectonic history. The most southwesterly corner of the area presently comprises a small segment of the Salton Trough, a deep sediment-filled structural depression. Known geothermal anomalies in the Salton Trough make the Yuma area a favorable exploration target even though spreading-center heat sources are not expected to occur there. Geological and geophysical investigations reveal that the area is made up of low, rugged northwest-trending mountains separated by deep sediment-filled basins. Relief is a result of both erosional and structural activity. Northwest-trending en-echelon faults bound the range fronts and the basins, and have created several horst blocks (basement highs) that crop out at or near the surface. The Algodonnes fault is inferred to represent the northeast margin of the Salton Trough and apparently an inactive extension of the San Andreas fault system. Extensive well-pumping and applications of irrigation waters in recent years have created an unnatural state of flux in the hydrologic regime in the Yuma area. Gravity and aeromagnetic anomalies trend strongly northwest through the region as do lineaments derived from Landsat and Skylab photos. Electrical resistivity values in the Bouse Formation are exceptionally low, about 3 ohn-m. Heat flow appears to be normal for the Basin and Range province. Ground-water temperatures indicate zones of rising warm water, with one such warm anomaly confirmed by sparse geothermal-gradient data.

1503 Geothermal Exploration And Exploration Technology

REFER ALSO TO CITATION(S) 62924, 62928

62929 (DOE/ET/27034—T1) Preliminary geothermal investigations at Manley Hot Springs, Alaska. East, J. (Alaska Univ., Fairbanks (USA). Geophysical Inst.). Apr 1982. Contract FC07-79ET27034. 85p. (UAG-R—290). NTIS, PC A05/MF A01. Order Number DE82020604.

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Manley Hot Springs is one of several hot springs which form a belt extending from the Seward Peninsula to east-central Alaska. All of the hot springs are low-temperature, water-dominated geothermal systems, having formed as the result of circulation of meteoric water along deepseated fractures near or within granitic intrusives. Shallow, thermally disturbed ground at Manley Hot Springs constitutes an area of 1.2 km by 0.6 km along the lower slopes of Bean Ridge on the north side of the Tanana Valley. This area includes 32 springs and seeps and one warm (29.1°C) well. The hottest springs range in temperature from 61° to 47°C and are presently utilized for space heating and irrigation. This study was designed to characterize the geothermal system present at Manley Hot Springs and delineate likely sites for geothermal drilling. Several surveys were conducted over a grid system which included shallow ground temperature, helium soil gas, mercury soil and resistivity surveys. In addition, a reconnaissance ground temperature survey and water chemistry sampling program was undertaken. The preliminary results, including some preliminary water chemistry, show that shallow hydrothermal activity can be delineated by many of the surveys. Three localities are targeted as likely geothermal well sites, and a model is proposed for the geothermal system at Manley Hot Springs.

62930 (DOE/ID/12026—T1) Heat flow, radioactivity, gravity, and geothermal resources in northern Colorado and southern Wyoming. Decker, E.R.; Buelow, K.L. (Wyoming Univ., Laramie (USA). Dept. of Geology and Geophysics). Dec 1981. Contract FC07-79ID12026. 27p. NTIS, PC A03/MF A01. Order Number DE82020751.

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The surface heat flow values in the Sierra Madre-Medicine Bow-Laramie Mountains region are in the range 0.6 to 1.5 HFU. When the heat from local bedrock radioactivity is considered, the reduced flux in these mountains is low to normal (0.6 to 1.2 HFU). These data and the low to normal gradients (10 to 25°C/km) in the studied drill holes strongly suggest that the resource potential of the Southern Rockies in Wyoming is low. The geothermal resource potential of the sedimentary basins in Wyoming that border these mountains also appears to be low because preliminary estimates for the flux in these areas are ≦ 1.5 HFU and the average gradients in analyzed drill holes are generally ≦ 30°C/km. In contrast to southern Wyoming, the high surface and reduced heat flows strongly suggest that the Park areas and other parts of the Southern Rockies in northern Colorado are potentially valuable geothermal resource areas. The narrow northerly borders (≦ 50 km) of these positive anomalies suggest that some of the resources could be shallow, as does the evidence for regional igneous and tectonic activity in the late Cenozoic. The small number of combined heat flow and radioactivity stations precludes detailed site-specific evaluations in these regions, but a few generalizations are made.

62931 (DOE/ID/12026—T2) Heat-flow studies in Wyoming, 1979 to 1981. Decker, E.R.; Heasler, H.P.; Buelow, K.L. (Wyoming Univ., Laramie (USA). Dept. of Geology and Geophysics). Dec 1981. Contract FC07-79ID12026. 44p. NTIS, PC A03/MF A01. Order Number DE82021739.

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Thirty heat flow values completed during May 1981 for Wyoming are tabulated and updated maps of heat flow in Wyoming and adjacent areas are presented.

62932 (LBL—14132) Final report of the Department of Energy Reservoir Definition Review Team for the Baca Geothermal Demonstration Project. Goldstein, N.E.; Holman, W.R.; Molloy, M.W. (eds.). (Lawrence Berkeley Lab., CA (USA)). Jun 1982. Contract AC03-76SF00098. 54p. NTIS, PC A04/MF A01. Order Number DE82020611.

The Baca project was terminated due to inability to find sufficient steam production to support the power plant. The following aspects of the project are discussed: regional geology; structure, stratigraphy, and permeability in the Redondo Creek; geophysics; geochemical indicators of reservoir conditions; drilling problems; fracture stimulation experiments; reservoir definition and conceptual model; and prediction of reservoir performance.

1506 Environmental Aspects And Waste Disposal

REFER ALSO TO CITATION(S) 62938

62933 **(DOE/ET/27146—T15) Damage to porous media due to the degradation of flocculants.** Vetter, O.J.; Kandarpa, V. (Vetter Research, Costa Mesa, CA (USA)). 17 Aug 1982. Contract AC03-78ET27146. 25p. NTIS, PC A02/MF A01. Order Number DE82021793.

The results of laboratory experiments involving the flow of two commercial flocculant solutions through Berea sandstone core plugs at 225°C are summarized. The two flocculants used are TFL-398 and TFL-362 (commercial flocculants supplied by Tretolite Division of Petrolite Corporation). The flow of brine containing these flocculants through these sandstone cores resulted in considerable permeability reductions during the flow experiments even when used at concentrations of only 5 ppM. The reduction in permeability is attributed to the plugging of pore spaces by the degradation products. The results of these experiments demonstrated that the use of a flocculant can cause severe formation damage. It is, therefore recommended, to always conduct laboratory tests prior to the use of any specific flocculant for geothermal applications to avoid any damage to injection wells.

62934 **(DOE/ET/27146—T16) Enhancement of heat production through selective scaling.** Vetter, O.J.; Kandarpa, V.; Harouaka, A. (Vetter Research, Costa Mesa, CA (USA)). 16 Aug 1982. Contract AC03-78ET27146. 51p. NTIS, PC A04/MF A01. Order Number DE82021792.

Portions of document are illegible.

The heat-depleted brine has to be reinjected whether it is for technical, economical, environmental and/or legal purposes. However, there are many problems related to injectivity and injectability in a geothermal field. The major drawback is the dread of an early breakthrough of the heat depleted brine at the production wells. It is believed that this drawback may be overcome through selective scaling. The results of investigation into the feasibility of selective scaling are summarized. Selective scaling is defined here as the process of intentionally precipitating large quantities of chemical compounds at selected locations, such as high permeability streaks or fractures, for the purpose of retarding the flow of injection fluids through these flow channels. Such flow retardation will increase the residence time of the injected fluids in the reservoir by a more suitable heat sweep thereby enhancing the heat extraction from the geothermal reservoir. Three different methods of selective scaling are discussed. These methods are: the injection of a thermodynamically unstable brine; injection of a slug of dirty brine or other thermodynamically unstable brine into selective locations of the reservoir; and mixing of an injection brine which is incompatible with a reservoir brine. The basis of these methods and their impact on the permeability characteristics of the reservoir are discussed through a precipitation model and through simple flow models. The application of these models are illustrated using Salton Sea brine and Currier 2 brine.

1508 Geothermal Power Plants

62935 **(DOE/ET/27125—T1) Sperry low-temperature geothermal conversion system. Volume I. Organic-working-fluid properties. Final report.** Carroll, C.; Hules, K.R.; Langley, R.; Toekes, B.; Wilson, D.P. (Sperry Research Center, Sudbury, MA (USA)). 1981. Contract AC03-78ET27125. 135p. (SRC-CR—81-74-Vol.1). NTIS, PC A07/MF A01. Order Number DE82018529.

Portions of document are illegible.

Measurements of the physical properties of R-114 in the compressed liquid and dense gas regions are reported. Included are: experimental studies of the thermodynamic properties of R-114, enthalpy measurement by throttling experiment, engineering model of the thermodynamic properties of R-114, feasibility study to dissociate R-114 with a four-cycle gasoline engine, transport properties of R-114, analytical procedure to determine impurities in R-114, toxicological information on Freons, and a literature search of published properties of R-114, other refrigerants, and other potential working fluids. (LEW)

62936 **Geothermal energy - its past and its future at PG&E.** Howe, H.M. (PG&E, San Francisco, CA 94106). *Transactions of the American Nuclear Society;* 39: 9(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

1509 Geothermal Engineering

REFER ALSO TO CITATION(S) 62932, 62933, 62934

62937 **(BNL—31737) Cathodic protection in highly-aggressive geothermal environments.** Bandy, R.; van Rooyen, D. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 28p. (CONF-820506—6). NTIS, PC A03/MF A01. Order Number DE82021561.

From International conference on geothermal energy; Florence, Italy (11 May 1982).

Portions of document are illegible.

The feasibility of cathodic protection in highly aggressive geothermal environments has been investigated in the laboratory using both impressed current and sacrificial anode techniques. Artificial brines simulating the hypersaline geothermal brines of the Imperial Valley of California and the less aggressive geothermal fluids found in some other parts of the US were used as test environments. Impressed current tests on carbon steel were conducted under controlled potential, and cathodic protection of carbon steel using zinc sacrificial anodes was studied by monitoring the galvanic current and potential of the couple with a zero resistance ammeter. Weight loss measurements were conducted in all cases to determine the amount of protection achieved. Results show that the weight loss generally follows a semi-logarithmic relationship with the amount of potential shift away from the corrosion potential as a result of the impressed current; significant cathodic protection can be achieved by shifting the potential of the order of only 70 to 80 mV. Under certain controlled cathodic conditions, electrocrystallization has been observed on the carbon steel surface, resulting in a small weight gain. For the carbon steel-zinc couple, the potential gradually drifts towards that of the open circuit potential of zinc, resulting in excellent protection for the steel and a relatively tolerable corrosion rate for zinc.

62938 **(DOE/ET/27146—T13) Scale formation at various locations in a geothermal operation due to injection of imported waters.** Vetter, O.J.; Kandarpa, V. (Vetter Research, Costa Mesa, CA (USA)). 22 Jun 1982. Contract AC03-78ET27146. 96p. NTIS, PC A05/MF A01. Order Number DE82021796.

Portions of document are illegible.

The injection of waters that are not native to a geothermal formation generates various physical and chemical problems. The major chemical problem resulting from such injections is the formation of sulfate scales (particularly CaSO4, BaSO4 and SrSO4) at various locations starting from the injection well through the production well to the surface facilities of any geothermal operation. One of the ways to prevent this type of scale formation is by reducing the sulfate concentration of the injection waters. The effect of sulfate deionization on scale formation at various locations of the geothermal operations is studied. Some experimental results on the CaSO4 scale formation in porous media upon heating an injection water with and without addition of scale inhibitors are also given.

62939 **(DOE/ET/27146—T14) Chemical damage due to drilling operations.** Vetter, O.J.; Kandarpa, V. (Vetter Research, Costa Mesa, CA (USA)). 14 Jul 1982. Contract AC03-78ET27146. 29p. NTIS, PC A03/MF A01. Order Number DE82021795.

The drilling of geothermal wells can result in near wellbore damage of both the injection wells and production wells if proper precautions are not taken. Very little specific information on the chemical causes for drilling damage that can directly be applied to the drilling of a geothermal well in a given situation is available in the literature. As part of the present work, the sparse literature references related to the chemical aspects of drilling damage are reviewed. The various sources of chemically induced drilling dam-

ages that are related to drilling operations are summarized. Various means of minimizing these chemical damages during and after the drilling of a geothermal well are suggested also.

62940 **(EGG—2213) Evaluation of materials for systems using cooled, treated geothermal or high-saline brines.** Suciu, D.F.; Wikoff, P.M. (Idaho National Engineering Lab., Idaho Falls (USA)). Sep 1982. Contract AC07-76ID01570. 55p. NTIS, PC A04/MF A01. Order Number DE83000653.

Lack of adequate quantities of clean surface water for use in wet (evaporative) cooling systems indicates the use of high-salinity waste waters, or cooled geothermal brines, for makeup purposes. High-chloride, aerated water represents an extremely corrosive environment. In order to determine metals suitable for use in such an environment, metal coupons were exposed to aerated, treated geothermal brine salted to a chloride concentration of 10,000 and 50,000 ppM (mg/L) for periods of up to 30 days. The exposed coupons were evaluated to determine the general, pitting, and crevice corrosion characteristics of the metals. The metals exhibiting corrosion resistance at 50,000 ppM chloride were then evaluated at 100,000 and 200,000 ppM chloride. Since these were screening tests to select materials for components to be used in a cooling system, with primary emphasis on condenser tubing, several materials were exposed for 4 to 10 months in pilot cooling tower test units with heat transfer for further corrosion evaluation. The results of the screening tests indicate that ferritic stainless steels (29-4-2 and SEA-CURE) exhibit excellent corrosion resistance at all levels of chloride concentration. Copper-nickel alloys (70/30 and Monel 400) exhibited excellent corrosion resistance in the high-saline water. The 70/30 copper-nickel alloy, which showed excellent resistance to general corrosion, exhibited mild pitting in the 30-day tests. This pitting was not apparent, however, after 6 months of exposure in the pilot cooling tower tests. The nickel-base alloys exhibited excellent corrosion resistance, but their high cost prevents their use unless no other material is found feasible. Other materials tested, although unsuitable for condenser tubing material, would be suitable as tube sheet material.

1510 Direct Energy Utilization

62941 **(PNL—4422-Vol.1) User manual for GEOCITY: a computer model for cost analysis of geothermal district-heating-and-cooling systems. Volume I. Main text.** Huber, H.D.; Fassbender, L.L.; Bloomster, C.H. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1982. Contract AC06-76RL01830. 223p. NTIS, PC A10/MF A01. Order Number DE82022512.

The purpose of this model is to calculate the costs of residential space heating, space cooling, and sanitary water heating or process heating (cooling) using geothermal energy from a hydrothermal reservoir. The model can calculate geothermal heating and cooling costs for residential developments, a multi-district city, or a point demand such as an industrial factory or commercial building. GEOCITY simulates the complete geothermal heating and cooling system, which consists of two principal parts: the reservoir and fluid transmission system and the distribution system. The reservoir and fluid transmission submodel calculates the life-cycle cost of thermal energy supplied to the distribution system by simulating the technical design and cash flows for the exploration, development, and operation of the reservoir and fluid transmission system. The distribution system submodel calculates the life-cycle cost of heat (chill) delivered by the distribution system to the end-users by simulating the technical design and cash flows for the construction and operation of the distribution system. Geothermal space heating is assumed to be provided by circulating hot water through radiators, convectors, fan-coil units, or other in-house heating systems. Geothermal process heating is provided by directly using the hot water or by circulating it through a process heat exchanger. Geothermal space or process cooling is simulated by circulating hot water through lithium bromide/water absorption chillers located at each building. Retrofit costs for both heating and cooling applications can be input by the user. The life-cycle cost of thermal energy from the reservoir and fluid transmission system to the distribution system and the life-cycle cost of heat (chill) to the end-users are calculated using discounted cash flow analysis.

62942 **(PNL—4422-Vol.2) User manual for GEOCITY: a computer model for cost analysis of geothermal district-heating-and-cooling systems. Volume II. Appendices.** Huber, H.D.; Fassbender, L.L.; Bloomster, C.H. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1982. Contract AC06-76RL01830. 186p. NTIS, PC A09/MF A01. Order Number DE82022511.

Portions of document are illegible.

The purpose of this model is to calculate the costs of residential space heating, space cooling, and sanitary water heating or process heating (cooling) using geothermal energy from a hydrothermal reservoir. The model can calculate geothermal heating and cooling costs for residential developments, a multi-district city, or a point demand such as an industrial factory or commercial building. Volume II contains all the appendices, including cost equations and models for the reservoir and fluid transmission system and the distribution system, descriptions of predefined residential district types for the distribution system, key equations for the cooling degree hour methodology, and a listing of the sample case output. Both volumes include the complete table of contents and lists of figures and tables. In addition, both volumes include the indices for the input parameters and subroutines defined in the user manual.

17 WIND ENERGY

1704 Economics

REFER ALSO TO CITATION(S) 62953, 63136

1706 Wind Energy Engineering

REFER ALSO TO CITATION(S) 62886

62943 **(BMFT-FB-T—82-057) Behaviour of a long term heat storage in connection with a wind energy converter (phase I).** Auer, F.; Bley, H.; Mueller, M. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Apr 1982. 65p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750627.

Heating of a glider museum planned to be built on the Wasserkuppe mountain (950 m) in the Rhoen hills by means of wind energy is technically and economically feasible. It will be possible to recover the capital cost within a period of 15 to 19 years if the service life of the wind energy converter (WEC) and of the heat storage system is between 20 and 30 years. At a maximum thermal load of the museum of 120 kW, the minimum cost will be achieved with a WEC power output of 120 kW and a two-day storage system. This combination permits 60 percent of the heat demand to be covered by wind energy. The balance will have to be supplied by conventional energy sources. The wind energy fraction of the total energy demand thus is about twice as high as the solar fraction in the case of solar heating systems and about 15 percent higher than the fraction of ambient heating energy in the case of electric heat pumps used in bivalent operation. The 'wind price' per kWh is already comparable to that expected for the future large wind energy converters (GROWIAN) to be produced in series.

62944 **(DOE/ET/20358—1) Assessing the local wind field for siting of wind-power systems. Final report, July 1976-June 1977.** MacCready, P.B. Jr. (AeroVironment, Inc., Pasadena, CA (USA)). Sep 1977. Contract AC06-77ET20358. 82p. NTIS (US Sales Only). Order Number DE82022202.

In complex terrain situations there is as yet no established practical and economical observational technique for ascertaining just how suitable a specific spot is for a WECS installation. The principal candidate techniques are instrumented tall towers, tethersonde, and various Doppler devices which measure the speed of atmospheric scatterers by laser, microwave, or acoustic methods. A review of the tradeoffs for each technique identifies the acoustic Doppler wind sounding as potentially the best compromise for a range of studies. An existing AV acoustic Doppler wind profile monitoring system, developed for air pollution investigation to 500

m in flat terrain, was modified into a configuration to be used for providing winds to 100 m simultaneously over two locations 1/2-mile apart. The system was tested against alternative measurement methods at two locations, and then used in a complex terrain situation to obtain actual field experience. It is concluded that: (1) the particular Doppler acoustic system was awkward to install in mountainous terrain for logistics reasons; (2) the particular data processing method was not able to give definitive measurements in the presence of large ground echoes (and such echoes were invariably present during the field phases of this program; and (3) the equipment operation was generally reliable. The insights gained during the course of this program are the basis of our conclusion that, with an alteration of the data processing scheme and some configuration changes, Doppler acoustic radars will constitute a reasonable observational technique for WECS siting in complex terrain situations.

62945 **(DOE/ET/23144—81/1) Response sensitivity of wind turbines to atmospheric turbulence.** Thresher, R.W.; Holley, W.E. (Oregon State Univ., Corvallis (USA). Dept. of Mechanical Engineering). May 1981. Contract AT06-79ET23144. 95p. NTIS, PC A05/MF A01. Order Number DE83000333.

The dynamic response of wind turbines to atmospheric turbulence is examined. The modeling handles both the wind inputs and the resulting loads using the analysis techniques of random vibration theory and spectral analysis. Presented are typical response results for a small, 8kW wind turbine and a large, 2.5 MW turbine. The turbine system mechanical model employs 5 degrees-of-freedom to represent the lower frequency motions of the system. The rotor is assumed to be rigid and is three bladed for simplicity. The aerodynamic forces are modeled using a simple quasi-static strip theory. The emphasis is placed on this model to identify the key turbulence inputs which are important in wind turbine design. On the basis of results computed for the two turbines modeled, it is determined that the most important turbulence inputs are the longitudinal fluctuations in the direction of the mean wind which act uniformly across the rotor disk (engulfs the rotor disk), and the across the disk gradients of the longitudinal wind fluctuations. Although each of these invokes a different machine response, they are judged to be of equal importance, because they each contribute significantly to the vibration energy of the lower system frequencies. The report presents numerous spectral density plots for the various turbine system responses, and discusses the results in some detail.

62946 **(DOE/ET/23144—81/2) Modeling the response of wind turbines to atmospheric turbulence.** Thresher, R.W.; Holley, W.E.; Smith, C.E.; Jafarey, N.; Lin, S.R. (Oregon State Univ., Corvallis (USA). Dept. of Mechanical Engineering). Aug 1981. Contract AT06-79ET23144. 316p. NTIS, PC A14/MF A01. Order Number DE83000334.

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Methods are developed for modeling the dynamic response of horizontal axis wind turbines to atmospheric turbulence. The dynamic system is made as simple as possible, while still retaining essential physical characteristics. The report describes how to model a turbine system using the 5 degrees-of-freedom to represent the lower frequency motions of the turbine system. The rotor is assumed to be rigid and is three-bladed for simplicity. Both the structural dynamic properties for this system and the aerodynamic influence coefficients which determine how the system will respond to atmospheric turbulence are developed. Two different wake models are used to compute the induced velocities at the rotor disk. The reader is introduced to the basic concepts involved in modeling the turbulent fluctuations of the wind. Using an approximation concept, the spatial variations of the turbulence are modeled with the first few terms of a series expansion. In addition, this report covers the use of filtered noise as a modeling approximation for the turbulence input and provides the necessary data for modeling the turbulence inputs for a wide range of turbine sizes. Finally, the governing equations for the turbine system and the turbulence inputs are combined to yield a state space description of the entire system. It is shown how decoupling of these equations allows power spectral densities of the various turbine responses to be computed. The computer program used to perform these computations is also discussed and listed.

62947 **(DOE/RL/10236—81/1) Lidar measurement of wind velocity turbulence spectra encountered by a rotating turbine blade.** Hardesty, R.M.; Korrell, J.A.; Hall, F.F. Jr. (National Oceanic and Atmospheric Administration, Boulder, CO (USA). Wave Propagation Lab.). 1982. Contract AC06-80RL10236. 25p. NTIS, PC A02/MF A01. Order Number DE82020966.

A homodyne CO_2 lidar system beam was conically scanned around a horizontal axis to measure the wind speed and turbulence characteristics encountered by a rotating turbine blade. Turbulence spectra obtained from the scanning lidar differed considerably from those calculated from fixed-point anemometer measurements, showing a redistribution of energy from lower to higher frequencies. The differences appeared more pronounced during periods when the atmosphere was stable.

62948 **(FFA-AU—1635) Preliminary theoretical study of double blade 2-D aerodynamics for applications to vertical axis wind turbines.** Weibust, E. (Flygtekniska Foersoeksanstalten, Stockholm (Sweden)). Apr 1981. 69p. (NE/VIND—81/5). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750055.

As part of a preliminary system feasibility analysis of a vertical axis wind turbine system LDB-VAWT, theoretical calculations of 2D aerodynamic characteristics of double blade configurations have been performed. The theoretical method used is a method developed at Lockheed, Georgia for NASA, here referred to as the NASA- Lockheed method, which computes the subsonic, viscous, attached flow about multielement airfoils. The objective of this preliminary study is to get an idea of how much energy is lost when using double blades instead of single. The resulting tangential force for the double or single blade configuration is used as a criterion for this , and shall be as great as possible (mean value). The following parameters are varied to see how the tangential force, expressed as Csub(t), is affected; the radial spacing, toe in toe out angle and tangential displacement (stagger). The results obtained indicate that the greatest Csub(t)-values are achieved for maximum allowable radial spacing, which is determined by structural considerations, and is assumed to be in the order of 1.5 c. At this rather large distances, stagger as well as toe in - toe out angle may only give slight improvements as long as the flow separation effects (stall region) are not considered. However, a large part of the energy is captured at relatively high wind speeds when the flow on the blades is partly separated (stalled). This can not be analysed with the NASA-Lockheed method, but is an area on which further studies must be focused.

62949 **(NE/VIND—80/39) Interaction in limited arrays of windmills.** Crafoord, C. (Naemnden foer Energiproduktionsforskning, Stockholm (Sweden)). Mar 1979. 54p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750056.

A review is made of the activities dealing with the problem of how closely packed an array of windmills can be erected without unduly interfering with each other. A general technical background is given for the behaviour of a single windmill in a homogeneous flow, together with a list of important parameters for the general performance of a group. Earlier results for neutral stratification are review and presented in a slightly different manner, more fully illustrating the trade-off between windmill density and mean efficiency as function of group size. The work by Faxen, utilizing the analogy between plumes and wakes as a basis for a model formulation, is reviewed. Preliminary results indicate a variation in mean efficiency of 13 % for a group with 80 units, which may correspond to a factor of 2.5 in area coverage. For a systematic study of the influence of different stratifications, a more realistic treatment of the turbulent processes in the boundary layer is necessary, than can be represented by the single parameter α. A dynamic one-dimensional planetary boundary layer (PBL) model is presented and redesigned for simulation experiments. Using it, the regeneration of the wind profiles behind a windmill unit is studied for different ambient conditions. Preliminary results indicate a variation of up to a factor of 9 in the rate of regeneration of the profiles. Results are presented to illustrate the capabilities of the model, but a great deal of experimenting remains before a systematic treatment

for different stratifications can be presented. How this can be done, using a statistical approach with lateral homogeneization of the wind profiles, is thoroughly discussed.

62950 **(NE/VIND—81/4) Some methods to connect a windpower induction generator to the utility network.** Carlsson, O.; Hylander, J. (Chalmers Tekniska Hoegskola, Goeteborg (Sweden)). Apr 1981. 6p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82750057.

When an induction generator is switched on to a grid, heavy inrush currents may appear, which may result in a transient voltage variation. By using inductors or thyristors in series with the generator, or capacitor excitation before synchronizing it, the inrush currents could be limited to acceptable levels.

62951 **(NP—2902390) Experimental investigation of systems to reduce structural loads on large wind turbines.** Stiemer, S.F. (Stuttgart Univ. (TH) (Germany, F.R.)). 7 Sep 1979. 78p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82902390.

Portions of document are illegible. Thesis.

The physical part of a hybrid model investigation was set up for a large wind turbine project. The model laws of dynamics are derived with the aid of dimensional analysis. A discussion of parameters showed that a dynamic model investigation taking into account all model laws was impossible. However, wind turbine calculations had been planned for another investigation, so that it was possible to use the model investigation for checking the accuracy of the algorithms of the calculations. Independent of this, the model investigation was to prove the function of a new control concept. In the experimental part of the dissertation, it is shown that by coupling the flapping angle with the angle of incidence in a suitable way separately for every rotor blade, the shaft moment vertical to the rotor plane due to wind gusts, wind shear, or changes in wind direction. Wind gusts were modelled by fans producing limited areas of excess speed at right angles to the rotor plane.

62952 **(PNL—4349) Simulation of wind-speed time series for wind-energy conversion analysis. Final report.** Corotis, R.B. (Pacific Northwest Lab., Richland, WA (USA)). Jun 1982. Contract AC06-76RL01830. 78p. NTIS, PC A05/MF A01. Order Number DE83000043.

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In order to investigate operating characteristics of a wind energy conversion system it is often desirable to have a sequential record of wind speeds. Sometimes a long enough actual data record is not available at the time an analysis is needed. This may be the case if, e.g., data are recorded three times a day at a candidate wind turbine site, and then the hourly performance of generated power is desired. In such cases it is often possible to use statistical characteristics of the wind speed data to calibrate a stochastic model and then generate a simulated wind speed time series. Any length of record may be simulated by this method, and desired system characteristics may be studied. A simple wind speed simulation model, WEISIM, is developed based on the Weibull probability distribution for wind speeds with a correction based on the lag-one autocorrelation value. The model can simulate at rates from one a second to one an hour, and wind speeds can represent short-term averages (e.g., 1-sec averages) or longer-term averages (e.g., 1-min or 1 hr averages). The validity of the model is verified with PNL data for both histogram characteristics and persistance characteristics.

62953 **Goodnoe Hills Complex: World's first large wind turbine farm.** *Transactions of the American Nuclear Society;* **39**: 9(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

20 ELECTRIC POWER ENGINEERING

2001 Power Plants And Power Generation

REFER ALSO TO CITATION(S) 62604, 62643, 62833, 62999, 63028, 63139, 63142, 63153, 63211

62954 **(BMFT-FB-T—82-035) Liquefied natural gas vaporization and electricity generation using closed cycle gas turbines.** Weber, D.; Waloch, M. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Mar 1982. 331p. (In German). NTIS (US Sales Only), PC A15/MF A01. Order Number DE82750617.

The energy released during the vaporization of liquefied natural gas (LNG) is not being used at present, which means an annual loss of thermal power to the amount of 1,500 MW world-wide. For the economic utilization of energy a plant was developed for LNG vaporization and electricity generation using closed cycle gas turbines. The design data are as follows: LNG mass flow 101.1 kg/s Natural gas volumetric flowrate (STP) 431,410 m³/h Power at terminals 100 MW Fuel consumption (natural gas) 16,070 m³/h Efficiency at terminals 55% Total utilization (electricity plus LNG vaporization heat) 93% The technology examined in the study can be applied in LNG terminals in Europe, Japan, and the U.S.A.

62955 **(DOE/ET/17091—T4) Electrocyclone development program. Quarterly technical report, August-October 1981.** (General Electric Co., Schenectady, NY (USA). Energy Systems Programs Dept.). 1981. Contract AC21-80ET17091. 27p. (FE—7091-18). NTIS, PC A03/MF A01. Order Number DE82005424.

Progress is reported in research on the use of applied electrostatics to enhance the performance of large (18-in. dia.) cyclone collectors for cleaning hot exhaust gases from pressurized fluidized bed (PFB) combustors in coal-fired power plants. Information is included on the electrocyclone cold flow test data; cyclone scaling; electrostatic component development; and redesign of the PFB test module. (LCL)

62956 **(EPRI-CS—2528) Condensation in steam turbines. Final report.** Kantola, R.A. (General Electric Co., Schenectady, NY (USA). Corporate Research and Development Dept.). Aug 1982. 100p. NTIS, PC A05/MF A01. Order Number DE82906486.

Condensation of water from moist air or steam has been an active research area for over eighty years. Research has been concentrated on the condensation of steam in turbines, where the moisture-induced efficiency losses and possibilities of erosion damage impose a lower limit on the expansion of the steam so that no more than a 10 to 12% moisture content is reached. In order to accurately assess and reduce the mechanical and thermodynamic losses (which can be as high as 4 to 8 percentage points of efficiency), the thermodynamic conditions at nucleation onset and the kinetics of the subsequent droplet growth must be accurately known. To overcome objections to prior data, a subsonic technique for investigating steam condensation has been developed which uses a non-steady expansion wave to provide a controlled but rapid expansion of slightly superheated steam. An optical measurement system uses the attenuation of laser light at two wavelengths to determine the droplet size and number density time histories. Fast response pressure transducers are used to determine the steam pressure during this transient test. Through the use of high speed digital recorders to capture the data, an accurate determination of the thermodynamic conditions at onset as well as a detailed description of the droplet growth kinetics has been obtained. The quality of the data is very high. The basic issue of what mechanism controls droplet growth rate has been raised. It is extremely important to know whether isolated droplet growth via impinging steam molecules is dominant or whether agglomeration plays a major role. The knowledge of when these different mechanisms are controlling can be of vital importance in trying to reduce the moisture-induced losses in steam turbines.

62957 (EPRI-RD—2369-SR) **Second conference on advanced materials for alternative-fuel-capable heat engines: proceedings.** (Department of Energy, Washington, DC (USA); Electric Power Research Inst., Palo Alto, CA (USA)). May 1982. 895p. (CONF-810885—). NTIS, PC A99/MF A01. Order Number DE82018875.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

Portions of document are illegible.

Forty-one papers were presented at the meeting. A separate abstract was prepared for each paper. (LCL)

62958 (EPRI-RD—2369-SR, pp 1.1-1.23) **Alternative liquid fuels.** Alpert, S.B.; Cohn, A. (Electric Power Research Inst., Palo Alto, CA). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

Starting with the facts that 25% of the electric power generated in the US comes from oil-fired power plants, and that the availability and cost of utility fuel oil in the future are subjects for concern, the feasibility of replacing this fuel with coal liquids, shale oil, and methanol and Fischer Tropsch liquids produced from synthesis gas is examined. The production, characteristics, and compatibility of these liquid fuels with combustion turbines and the economics and environmental impacts of their use are discussed. Research and demonstration efforts needed to establish the technical and economic feasibility of using these liquid fuels are specified. (LCL)

62959 (EPRI-RD—2369-SR, pp 1.25-1.52) **Coal gasification combined cycle systems: development status, gas quality and control considerations.** May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

EPRI studies show Integrated Coal Gasification Combined Cycle (IGCC) plants equipped with currently commercial gas turbines to be economically competitive with direct coal fired units equipped with stack gas scrubbers. Further improvements in gasification and gas turbine technology should render such IGCC systems more attractive. The status of development of the major candidate coal gasification processes is reviewed. The composition ranges of the product gases are discussed with reference to combustion characteristics in the gas turbine. The results of gas quality monitoring from EPRI test programs on gasification pilot plants are presented showing that current gas clean up technology should be more than adequate to meet gas turbine requirements. The control of IGCC systems is briefly discussed. Finally, the major remaining IGCC development issues are addressed and a brief account given of the 100 MW Texaco coal gasification combined cycle plant project to be located at Southern California Edison's Cool Water station near Barstow, California.

62960 (EPRI-RD—2369-SR, pp 1.53-1.69) **Economics of alternative fuels for electric power generation.** Gluckman, M.J. (Electric Power Research Inst., Palo Alto, CA). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

Estimates of both capital and production costs for coal gasification based power systems are presented. Estimates of the potential selling prices of coal-derived liquid fuels (produced by direct and indirect techniques) as a function of plant ownership (regulated utility company or nonregulated producer) are also presented. The competitive position of these coal-derived liquids with respect to equivalent crude oil derived products is addressed.

62961 (EPRI-RD—2369-SR, pp 2.115-2.125) **Combined-cycle power plant via pressurized fluidized-bed combustion.** Hoy, H.R. (National Coal Board, Leatherhead, England); Roberts, A.G.; Stringer, J. May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

Compared with conventional pulverized coal-fired power plant with scrubbers, the pressurized fluidized bed combustion (PFBC) combined-cycle plant potentially offers around 5% generating efficiency improvement, lower NOx emission, smaller plant size, and ultimately at least 10% lower capital costs. Two main types of PFBC combined cycle are under consideration: (1) the supercharged boiler cycle, in which steam is generated superheated and reheated in tubes within the bed and the hot gases are passed through a gas turbine followed by a heat recovery system; and (2) the airheater cycle, in which air is heated in tubes within the bed and then mixed with cleaned hot combustion gases before passing through a gas turbine followed by a waste heat boiler. In both schemes, crushed coal is burned in a fluidized bed which is composed mainly of partially-sulphated dolomite together with some coal ash. The relatively low combustion temperature of 850 to 950°C minimizes volatilization of the alkali constituents and does not produce sintering of the ash. This feature, aided by three stages of efficient cyclone dustcollectors, is considered likely to result in combustion gases giving economically acceptable rates of erosion, corrosion and fouling of gas turbine blades. The areas in which the choice of materials is vital are: gas turbine blades and protective coatings for them; the tubes immersed in the bed for generating superheating and reheating steam, or for heating air together with their supporting structures which necessarily work at close to combustor temperatures; and materials used in the hot gas cleaning equipment. The paper discusses the operating conditions to which materials in the two cycles will be subjected and summarizes investigations of the corrosion and erosion of in-bed materials and gas turbine blades which have been made during the course of tests of several thousand hours duration, in the UK and USA.

62962 (EPRI-RD—2369-SR, pp 3.1-3.26) **Diesel engine research and development for alternative fuel operation.** Fairbanks, J. (Dept. of Energy, Washington, DC). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

Diesel engine research aimed at determining engine performance using coal-derived and shale-derived fuels is reviewed with references to the combustion process in diesel engines, fuel/engine compatibility, emissions characteristics, pollution control requirements and equipment, fuel feeding systems, and the corrosive and erosive effects of combustion products from the synthetic fuels. It is concluded that emission and engine corrosion and erosion problems are the main obstacles to be overcome and that multi-fuel capability rapidly emerges as a top priority diesel engine R and D goal as long as it has superimposed appropriate engine durability, performance and emission concerns. Low-speed diesel engines and, to a lesser but still substantial degree, medium speed diesels have a multi-fuel capability unmatched by other production heat engines. The very attractive high efficiency of the diesel over a wide power range makes it virtually the unanimous choice for commercial marine propulsion of new construction and a strong option for replacing existing steam and gas turbine propulsion engines.

62963 (EPRI-RD—2369-SR, pp 3.27-3.41) **Metallic heat exchangers.** Stringer, J. (Electric Power Research Inst., Palo Alto, CA); Lukas, H. May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

Large numbers of heat exchangers will be required in advanced energy systems to make the most effective use of expensive fuels. These will range from waste heat recovery units at the exhaust end, operating at lower temperatures and pressures, to the high temperature, high pressure primary heat exchangers in indirectly fired gas turbines. There are two types of heat exchangers: recuperators and regenerators. Most metallic recuperators are either plate and fin or tube and shell: the latter is probably better at high pressures, the former is likely to be more efficient and rather cheaper at lower pressures. Materials problems are related to fabrication, particularly welding and brazing; thermomechanical fatigue; erosion; and low and high temperature corrosion. For alternative fuel fired systems the most severe problems will probably be encountered with the primary heat exchanger in indirectly fired systems and with the syngas cooler in entrained gasifier integrated combined cycle systems.

62964 (EPRI-RD—2369-SR, pp 3.43-3.58) **Advanced cooling of utility gas turbine engine components.** Cohn, A. (Electric Power Research Inst., Palo Alto, CA). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

The major improvement desired by utilities for combustion turbine power plants is increased reliability. In order to assist the improvement in reliability, EPRI has the High Reliability Gas Turbine, project RP1187. There is also the desire to lower heat rate and the cost of electricity. For combustion turbine combined cycle plants, this can be accomplished by raising the turbine inlet temperature. However, in the past an increase in turbine inlet temperature has been associated with a decrease in reliability and durability, especially as metal temperatures have risen. It is the purpose of the EPRI Advanced Cooling Engine project RP1319, to apply advanced cooling and fabrication techniques to the engine hot section in order to lower metal temperatures while allowing growth in turbine inlet temperatures to the competitive levels expected in the mid and late 1980s. It is also desired to increase the engine fuel flexibility. The improvements should be compatible with fuels of high ash contents and low hydrogen levels. A number of projects within RP1319 have been started. Phase I involved the preliminary design and analysis of advanced cooling components along with conceptual design and performance analysis of the overall engines and powerplants utilizing these components. Phase II is for the detailed design, fabrication, and acceptability tests of these advanced cooling components. Progress in each of these phases is briefly reviewed.

62965 (EPRI-RD—2369-SR, pp 3.59-3.73) **US Department of Energy high temperature turbine technology program.** Manning, G.; Neal, J. (Dept. of Energy, Washington, DC). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

The clean, efficient use of coal in the utility sector is an important goal in US plans for conserving petroleum and natural gas fuels. The gasification-gas turbine combined cycle (GCC) system promises improved environmental, thermodynamic and economic performance as compared with other advanced coal systems. Considering the advantages of the advanced GCC system, the Department of Energy initiated the High Temperature Turbine Technology (HTTT) Program in 1976. This technology effort seeks to increase the overall firing temperature of utility size gas turbines from today's 2000°F (1095°C) levels with clean fuels to 2600-3000°F (1427°C-1650°C) with coal-derived fuels containing a broader range of contaminants than current gas turbine specifications permit. These increases in turbine temperature levels, if successfully developed, will result in gasification combined cycle GCC systems with overall power generation economics 20 to 30% better than current technology pulverized-coal steam systems with flue gas desulfurization. Development of advanced turbine technologies are particularly important now that the private sector has made a commitment to demonstrate gasification combined cycle at full scale. Work in progress to develop the gasifier, hot gas cleanup system, and water- or air-cooled gas turbines, and overall GCC system is reviewed. (LCL)

62966 (EPRI-RD—2369-SR, pp 4.1-4.25) **High temperature corrosion in heat engines.** Stringer, J. (Electric Power Research Inst., Palo Alto, CA). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

The use of alternate fuels in heat engines will introduce some new problems in high temperature corrosion and extend the range of some already well-known problems. It is shown that the majority of the high temperature corrosion problems can be categorized as either mixed oxidant corrosion or salt-induced accelerated oxidation. The most important case of the former is sulfidation-oxidation corrosion in gasifier environments and in fluidized bed combustion; the most important example of the second is alkali sulfate induced hot corrosion. The general mechanisms of the corrosion processes are summarized; examples are given of different practical problem areas; and the various approaches to the solution of the problems are outlined.

62967 (EPRI-RD—2369-SR, pp 4.27-4.51) **Materials constraints from the erosion-corrosion potential of alternative fuel sources.** Wright, I.G.; Pierson, W.R. (Battelle Columbus Labs., Columbus, OH). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

The design or modification of heat engines to operate on alternative fuels requires some definition of the types and seriousness of the problems expected to be encountered by the critical components from handling and combusting the fuels. In the first instance, alternative fuels will be made to meet existing fuel standards for a given duty, which provide some limitations on, for instance, properties such as viscosity and boiling point, and on impurity contents such as sulfur, alkali metal, and ash levels. A cursory examination of the fuel types likely to be derived from the processing of coal suggests that the ranges of impurity types, and the forms of the contained solids, may be considerably different from those regulated by current fuel specifications. In some cases this will necessitate a redefinition of tolerable limits of ash, for instance, and an examination of the effects of impurities for which there is no established experience. As an aid to developing a strategy to address these needs, an attempt has been made in this paper to examine the types of processes utilizing coal which may provide fuel for gas turbine engines, and to define the duties and therefore the specific environments likely to be encountered by hot gas-path components. The results of actual turbine tests or related laboratory studies under conditions simulating aspects of specific alternative fuel usage have also been considered, with a view to finding common problems and solutions.

62968 (EPRI-RD—2369-SR, pp 4.53-4.72) **Corrodant sources, corrosion and deposition in distillate and heavy oil-fired turbines.** Spengler, C.J. (Westinghouse Research and Development Center, Pittsburgh, PA); Scheirer, S.T.; Marlow, J.H.; Vitello, J.J. May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

This study was undertaken to compare the corrosion behavior of hot gas path turbine parts from Florida Power and Light's East Palatka Plant when turbines were operated with either a distillate oil or a combination of distillate and a heavy fuel oil. The study included the determination of corrodant sources, characteristics of deposition of corrodants in the compressor and the combustion turbine, and the correlation of the deposits to the initiation of hot corrosion attack in the turbine. It was found that elements concentrated in the compressor entered the combustion turbine. The deposits which formed in the turbines as a result of use of a heavy fuel oil with a magnesium additive depended on the temperature of the substrate. Corrosion attack due to vanadium compounds in the heavy fuel-fired machines was nil; however, some indication of hot corrosion attack was found in all of the turbines. The corrodants were mainly attributed to the ingestion of contaminated mist from adjacent cooling towers through the compressors. It was concluded that hot part corrosion degradation was not increased from heavy fuel operation.

62969 (EPRI-RD—2369-SR, pp 4.73-4.107) **High-temperature combustion of residual fuel oil - some deposition product considerations.** Whitlow, G.A. (Westinghouse Research and Development Center, Pittsburgh, PA); Lee, S.Y.; Mulik, P.R.; Wenglarz, R.A.; Sherlock, T.P.; Cohn, A. May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

As traditional combustion turbine fuels such as natural gas and distillate oil become less abundant and more costly, the use of alternatives such as lower-grade oils and coal-derived products will intensify. There is some concern that the higher levels of impurities in these future fuels may well lead to enhanced corrosion and/or deposition of hot gas path components, resulting in less efficient machines. A joint Westinghouse/Electric Power Research Institute (EPRI) program, therefore, was initiated, whose objective was to develop information on operational and materials considerations associated with the combustion of residual fuel oil and coal-derived liquids in utility gas turbines. Data on corrosion and deposition ef-

fects from the combustion of washed and treated residual oil are described and interpreted in the light of next generation machines operating at high gas temperatures (2300°F (1260°C)). Information is presented on the nature and extent of these effects and their implications with respect to deposition mechanisms and subsequent turbine maintenance requirements.

62970 (EPRI-RD—2369-SR, pp 4.109-4.135) **Mechanical property requirements for hot section components in gas turbines.** Ostergren, W.J.; Embley, G.T. (General Electric Co., Schenectady, NY). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

Requirements for improved efficiency and output have led gas turbines in the past to continually higher firing temperatures and increased sizes. This has been achieved through the use of high-strength, creep-resistant superalloy materials together with advanced cooling of critical hot-gas-path components (buckets, nozzles, and combustors). Critical hot section components include the combustor, buckets, and nozzles. Designs and material properties must be balanced so as to achieve adequate resistance to a variety of potential failure mechanisms. Air-cooled buckets must possess both adequate low-cycle fatigue life and resistance to creep rupture (due to centrifugal and gas bending loads). Design against low-cycle fatigue crack initiation must be considered for the airfoil, where there are high thermal strains, as well as regions of high stress concentration. Combustor hardware must be carefully designed to avoid creep distortion problems as well as fatigue cracking in welded joints and cooling hole regions. Because of the competing influences of numerous potential mechanical failure modes, significant tradeoffs in properties must be made. Such tradeoffs will vary depending upon the expected operating conditions of the turbine. This, in turn, has required the development of sophisticated mechanics of materials approaches for predicting component life under cyclic and steady loading conditions in varied environments. These approaches must be flexible enough to account for the effect on life criteria of advanced processing techniques such as coatings, claddings, composite constructions, etc. This paper illustrates the role of mechanics of materials in development of mechanical property requirements for advanced hot-gas-path components.

62971 (EPRI-RD—2369-SR, pp 4.137-4.162) **Problems that may result from burning coal derived fuels in gas turbines.** Hancock, P.; Nicholls, J.R. (Cranfield Inst. of Tech., England). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

The problems likely to be encountered in burning coal-derived fuels in gas turbines have been examined and some preliminary experiments have been made, using the Cranfield burner rigs with a solvent refined distillate SRCII fuel, supplied as a blend of 2.9 to 1 mid distillate to heavy distillate fractions. The characteristics of the solvent refined fuels have been studied. Their high carbon to hydrogen ratios are shown to cause carbon deposition on the burner can, which can only be eleviated by substantial modification of conventional combustors. The high aromatic content of the fuel causes handling and effluent problems and the precautions to be taken are examined. The fuel supplied surprisingly had a high vanadium content (30 ppM) and this caused characteristic vanadic corrosion of CoCrAlY coated specimens exposed to the combusted fuel at 750°C for 100 hours. Various types of CoCrAlY coatings have been examined under these conditions on IN792, Mar M509 and X40 substrates. The graded sputter coatings and proprietary PVD CoCrAlY coatings were more resistant to corrosive attack than sputter coatings of fixed composition and IN792 was the best of the substrate materials tested. Platinum underlay coatings were not found to give the beneficial effects reported in other test environments.

62972 (EPRI-RD—2369-SR, pp 4.163-4.174) **Tribological screening of ceramic materials for use in advanced diesel engines.** West, A.I.; Syniuta, W.D. (Advanced Mechanical Tech., Inc., Newton, MA). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

As residual fuels, coal-based liquid fuels, and coal-oil slurries replace the more highly refined petroleum-based engine fuels, advances in engine component tribology will be needed. The objective of this program was to evaluate ceramics as alternative materials for use in large, stationary diesel engines. Recognizing the complexity of a subject such as friction and wear in a reciprocating engine with the many possible interactions of wear mechanisms, materials, lubricants, surface conditions, operating conditions, etc., this research included the identification and characterization of potential materials which might be incorporated into existing engine designs; screening of these materials with relatively simple laboratory apparatus especially designed for this purpose; SEM analysis of the wear surfaces; and the development of an accelerated wear test utilizing a single-cylinder diesel engine burning No. 2 diesel oil while ingesting coal dust. The results of the tribological screening tests are presented. Diesel tests have not been completed. The materials evaluated includes titanium carbides, silicon carbides, boron carbide, silicon nitrides, zirconium oxides, and aluminium oxides. The results showed: little correlation between a material's tribological characteristics and its mechanical properties; the material processing method had a definite effect on wear characteristics; TiC performed extremely well at high temperatures; and ZrO_2 had surprising low wear. It was concluded that the use of ceramic materials in diesel application is promising. (LCL)

62973 (EPRI-RD—2369-SR, pp 4.175-4.189) **Coal slurry tests with a slow speed two-stroke cycle diesel engine, conclusions and predictions.** Steiger, H.A. (Sulzer Brothers, Winterthur, Switzerland). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

Since the slow speed large bore diesel engine has until recently been absent from the US market scene, few people in the States are actually familiar with this type of energy converter. The paper therefore starts out with a brief characterization of such engines. The reason for entering the US market in both fields, marine and stationary, is to be found in the new economic situation, favoring slightly more expensive machinery using less fuel. An added argument is its potential for burning coal-based fuels in the future. The later feature represents actually the central theme of this paper. Tests are described which were conducted with such an engine using coal slurries provided by the US Department of Energy. This includes engine performance and the findings after dismantling the engine and inspecting piston, piston rings and liner as well as the injection nozzle. The analysis of these results point to the need for further R and D work in order to reduce wear and erosion problems caused by the high ash content of this kind of fuel. It is expected, however, that this work will lead to satisfactory results by reducing the ash content of the fuel on one hand, and increasing the hardness of liners, piston rings and fuel spray-nozzles on the other hand.

62974 (EPRI-RD—2369-SR, pp 4.191-4.211) **Turbine materials erosion/corrosion in an experimental PFBC simulator.** McCarron, R.L.; Beltran, A.M.; Brobst, R.P.; Spriggs, D.R. (General Electric Co., Schenectady, NY). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

The direct combustion of coal in pressurized fluidized bed combustor (PFBC) combined cycle power plants is a promising near-term solution to the national need to use coal more effectively for electric power generation. One of the key questions regarding the development of this system involves the life of gas turbine hot section components in the effluent from the PFBC. The potentially corrosive alkali (Na + K) vapor from a PFBC is estimated to be greater than the acceptable limit for present gas turbine superalloys based upon conventional liquid fuel experience. The loading and size distribution of the PFB particulate effluent may cause degradation of gas turbine superalloys by erosion, if limits are exceeded. During the past four years, two experimental programs have been conducted to evaluate turbine materials' durability in the effluent from PFBC. Candidate alloys for gas turbine applications were exposed to the high temperature, high velocity PFBC exhaust gas stream for up to 1000 h and evaluated for erosion/corrosion/deposition. The EPRI recognized the need for a test rig which allowed

for flexibility in simulating the significant aspects of erosion, corrosion, or combined processes in PFBCs. The simulator was to be used to evaluate the effects of changes in key operating conditions on erosion/corrosion of turbine materials and to evaluate the erosion/corrosion behavior of advanced coatings/claddings in the simulated PFBC environment for the purpose of selecting the best materials. The design and operation of the simulator are described. To date, a total of 2500 h of erosion, corrosion and erosion-corrosion testing has been conducted on the simulator at a gas temperature of 1600°F and gas/particle velocities of 960 f/s and 1170 f/s using PFBC particulate as the erosive medium.

62975 (EPRI-RD—2369-SR, pp 5.1-5.22) **Materials development for a water-cooled gas turbine.** Schilling, W.F.; Muth, M.C.; Schilke, P.W.; Collins, M.F.; Caruvana, A. (General Electric Co., Schenectady, NY). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

The DOE-sponsored High-Temperature Turbine Technology (HTTT) Program for a water-cooled gas turbine at firing temperatures (defined as the inlet temperature to the first-stage rotor) in the 1427-1649°C range is now nearing the completion of the component demonstration phase. A major portion of this effort was based on a comprehensive materials development program, which is the principal focus of this paper. The primary application of this technology is in an Integrated Gasification Combined Cycle (IGCC). An IGCC incorporating water-cooled gas turbines offers significant incentives to the utilities, and ultimately to the consumers, in the form of higher efficiencies and the associated lower cost of electricity. Information is included on the design, materials selection and testing of the water-cooled nozzles, water-cooled buckets, and the combustor. Materials and process barrier problems were resolved during the course of these materials development programs which led to the following results: verification of the suitability of the Cu-MZC alloy for the stage-one composite nozzle; verification of diffusion-bonding methods for fabrication of a composite, water-cooled nozzle; optimization of cast alloy 718 for second- and third-stage nozzles; selection of forging parameters for alloy 718 use in all three stages of turbine buckets; and verification of excellent stress-corrosion cracking resistance for the selected materials that will be in contact with water. (LCL)

62976 (EPRI-RD—2369-SR, pp 5.23-5.42) **Transpiration air cooling for high temperature turbines operating on coal derived fuels.** Wolf, J. (Curtiss-Wright Corp., Wood-Ridge, NJ); Mogul, J.; Moskowitz, S.; Manning, G. May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

Transpiration air-cooling is a concept selected for cooling high temperature gas turbine blades and vane airfoils for gas turbines in combined-cycle power plants fueled with coal-derived liquids or gaseous fuels. The design, materials-selection, fabrication and testing of these turbine components are described. Tests were performed to determine the effects of the hot gas stream on the physical condition of the turbine components and the turbine performance. After 800 h of testing, with 600 h at hot gas temperatures from 2600°F to 3000°F and fly ash particle loadings of 20 to 28 WPPM, the transpiration air-cooled components showed minimal oxidation and particle deposition; no oxidation, erosion, nor sulfidation, no mechanical or thermal distress in any turbine components, and neglible deterioration of engine performance. (LCL)

62977 (EPRI-RD—2369-SR, pp 5.43-5.65) **Wafer cooling for industrial gas turbine blades and vanes.** Brown, B.T.; George, D.B. (Pratt and Whitney Aircraft, Lake Park, FL). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

The application of wafer construction techniques to turbine vanes and blades offers significant potential increases in reliability, durability, and dirty fuel tolerance for marine and industrial gas turbine engines. In programs with DOE and EPRI, Pratt and Whitney Aircraft has demonstrated the feasibility of wafer cooling and confirmed the ability to produce wafers in industrial engine sizes using current industrial engine turbine alloys. Wafer construction provides highly effective cooling and reduced airfoil temperature gradients without requiring airfoil surface discharge film holes which are susceptible to plugging from dirty fuels. Water airfoil construction consists of making a vane or blade from a stack of relatively thin wafers whose surfaces are individually photo-etched to produce cooling flow passages that are impossible with any other form of construction. The cooling of each wafer can be individually tailored for the local heat input at any point on the airfoil. The wafers are then stacked, joined and final machined to produce the final vane or blade contours. The wafers can be oriented either radially or chordwise. Blades produced from wafers have twice been demonstrated in the highly advanced F100 military aircraft engine. Recently demonstrated high-strength joining techniques have made wafer construction viable for gas turbine application. New alloys being produced by the Pratt and Whitney Aircraft Rapid Solidification Rate Process in combination with wafer construction could produce blades and vanes with temperature capabilities superior to anything produced today. In this paper, wafer constuction is discussed with an emphasis on industrial/marine applications. The DOE and EPRI programs are reviewed as well as alloys which have and could be used along with a proposed method of producing low cost wafer vanes.

62978 (EPRI-RD—2369-SR, pp 6.22-6.53) **Development of ceramic heat exchangers for indirect fired gas turbines.** Bakker, W.T. (Electric Power Research Inst., Palo Alto, CA); Kotchick, D. May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

Utilizing dirty fuels such as coal in gas turbine engines requires that heat input to the cycle working fluid occur through a heat exchanger. For high cycle efficiencies such a heat exchanger must operate in the 700 to 1400 KPA, 1100 to 1200°C (100 to 200 psi, 2000 to 2200°F) range. In this temperature range, ceramic heat exchangers are required. Ceramic heat exchangers that can operate in this regime have been under development for several years on a very modest scale. These programs are briefly reviewed. Major material issues are reviewed and the status of each is presented. Mechanical reliability and joining technology have been successfully demonstrated in short term tests. Long-term durability and the manufacturing technology to produce large scale components reproducibly remains to be demonstrated in the future.

62979 (EPRI-RD—2369-SR, pp 6.54-6.81) **Ceramic coatings for use in alternate fuel applications.** Vogan, J.W.; Hsu, L.L.; Stetson, A.R. (Solar Turbines International, San Diego, CA). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

The results of tests conducted on ceramic coatings in combustion environments generated by several different fuels are presented. Evaluations were made using municipal waste, solvent refined coal, Diesel No. 2 with controlled contamination levels of elements such as sodium, sulfur and vanadium as the fuel. Test methods employed municipal waste combustors, gas turbine engines, laboratory burner rigs and furnaces. Vitreous and plasma sprayed coatings were compared. It was found that no single coating system was best in all environments. Vitreous coatings gave the best performance at lower temperatures (< 600°F), high ash (municipal waste) combustion products while the plasma sprayed coatings were selected for gas turbine applications. A plasma sprayed coating greatly extended the life of a low NOx combustor and components with a vitreous coating were unaffected by conditions that destroyed corrosion resistant steel in a municipal waste incinerator.

62980 (EPRI-RD—2369-SR, pp 6.82-6.101) **Studies of thermal barrier coatings for heat engines.** Bratton, R.J.; Lau, S.K.; Andersson, C.A.; Lee, S.Y. (Westinghouse Research and Development Center, Pittsburgh, PA). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

This paper summarizes studies conducted on the high-temperature corrosion resistance of ZrO_2 x Y_2O_3, ZrO_2 x MgO and Ca_2SiO_4 plasma sprayed coatings that are candidates for use as thermal barrier coatings in heat engines. Coatings were evaluated in

both atmospheric burner rig and pressurized passage tests using GT No. 2 fuel and that doped with corrosive impurities such as sodium, sulfur and vanadium. The test results showed that the coatings perform very well in the clean fuel, pressurized passage tests as well as burner rig tests. With impure fuels, the test results revealed that while the coatings encountered greater damage in pressurized passage tests, the fuel sensitivity of each coating system exposed to both types of tests were qualitatively similar. It was found that chemical reactions between the ceramic coatings and combustion gases/condensates played the critical role in coating degradation. The degradation mechanism for each coating system is discussed. This work was conducted for NASA and EPRI under contract NAS3-21377. Advanced coating development studies have also been conducted for NASA and DOE under contract DEN3-110. A brief discussion of the progress being made in improving coating durability towards impure fuels is given.

62981 (EPRI-RD—2369-SR, pp 6.102-6.117) **Processing technology for advanced metallic and ceramic turbine airfoil coatings.** Duvall, D.S. (Pratt and Whitney Aircraft, East Hartford, CT). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

Ceramic coatings offer a promising means to protect gas-turbine airfoils against future higher temperature and/or corrosive combustion environments. However, considerable improvements must be achieved in the durability of these coatings before they can be reliably utilized. Wide variations in spall resistance have been observed with current systems depending on coating fabrication techniques. Plasma sprayed MCrAlY plus zirconia coatings have exhibited 20-to-1 differences in life depending upon processing variables which affect the strain tolerance, stress state, and oxidation resistance of coating microstructures. Some zirconia coatings fabricated by the electron-beam physical vapor deposition possess considerably greater durability. To date, the greatest improvements in ceramic coating durability have been achieved through processing rather than composition development. Programs are currently underway to determine the utility of these process-improved ceramic coatings for future aircraft and industrial gas turbines.

62982 (EPRI-RD—2369-SR, pp 6.131-6.149) **Response of plasma sprayed MgO x ZrO_2 and ZrO_2-6.6Y_2O_3 thermal barrier coatings to thermal fatigue and hot corrosion.** Taylor, T.A.; Price, M.O.; Tucker, R.C. Jr. (Union Carbide Corp., Indianapolis, IN). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

Thermal barrier coatings on gas turbine blade and vane gas-path surfaces offer several potential advantages; higher operating efficiency because higher gas temperatures or less cooling air can be used, reduced fabrication cost through the elimination of airfoil cooling holes, reduced corrosion rates, etc. Plasma deposition appears to be the most economical and flexible method of producing thermal barrier coatings. Thermal barrier coatings with 22 variations in oxide coating density, thickness, oxide-type and with and without intermediate layers of Cr or Ni-20Cr, were made, and subjected to a combined thermal fatigue and isothermal air oxidation test. The goals of this program were achieved. A new thermal barrier coating was identified which had much superior thermal fatigue resistance than previous base-line thermal barrier coatings. The high density plus microcracked ZrO_2-6.6Y_2O_3, lasted about three times longer in a 2260°F thermal fatigue test, and more than five times longer in the 2100°F test than the current standard, medium density MgO x ZrO_2. Both the MgO x ZrO_2 and ZrO_2-6.6Y_2O_3 families of coatings passed the cyclic corrosion test without failure. The usefulness of a controlled microcrack population and an internally strong oxide microstructure was also demonstrated. Each of these elements of structure control improved the thermal fatigue life of the base-line medium density coatings. In the case of the ZrO_2-6.6Y_2O_3 system these improvement factors were the most impressive.

62983 (EPRI-RD—2369-SR, pp 6.151-6.184) **Development of electron beam physical vapor deposition of ceramic coatings.** Demaray, R.E.; Halnan, W.K.; Shen, S. (Airco Temescal Div., Berkeley, CA). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

The Turbine Coating Group of Airco Temescal Division has developed a dedicated e-beam physical vapor deposition (P.V.D.) ceramic coater furnace with enhanced capability for the production of ceramic coatings by reactive oxide deposition. This equipment, together with the associated process development, is reviewed. The results of physical metallography and process development are correlated. The influence of deposition cycle parameters on the columnar oxide morphology and, in particular, the attendant resistance of the thermal barrier coating to thermochemical aging, is related.

62984 (EPRI-RD—2369-SR, pp 6.185-6.204) **Thermal barrier coatings research at NASA Lewis.** Levine, S.R.; Miller, R.A.; Gedwill, M.A. (NASA Lewis Research Center, Cleveland, OH). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

Thermal barrier coatings can give effective thermal protection to air-cooled heat engine components. The future use of these coatings in the turbine sections of aircraft and electric utility gas turbine engines can provide significant gains in efficiency or durability. Much of the impetus for current research into thermal barrier coatings came from the successful gas turbine engine test of a two-layer coating system applied to first stage blades. The plasma-sprayed coating consisted of a zirconia-yttria ceramic layer over a NiCrAlY alloy bond coat layer. The status of ceramic coatings research at NASA Lewis is reviewed. The major thrusts are: modeling of coating thermo-mechanical behavior, understanding coating adherence and degradation mechanisms in clean and dirty combustion gases, understanding the phase stability and properties of the coating materials, improving coating strain tolerance through structure modification, and improving plasma spraying technology. In addition, engine evaluations of coatings are being used to augment laboratory experience.

62985 (EPRI-RD—2369-SR, pp 7.1-7.16) **Protective coatings for electric utility gas turbines.** Goebel, J.A. (Pratt and Whitney Aircraft, East Hartford, CT); Giggins, C.S.; Krasij, M.; Stringer, J. May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

The primary purpose of this paper is to report on the progress of work to develop more advanced coatings for utility gas turbine airfoils operating at 1100 to 1400°F. The effort has been directed primarily toward evaluating duplex or two-layer coatings of the MCrAlY/Si and MCr/Si type. The objective of this test has been to evaluate both conventional and improved MCrAlY underlayers, applied by electron beam physical vapor deposition (PVD) and by low pressure chamber spray (LPCS) processes. In addition, three methods to develop the silicon-rich outerlayers are being evaluated. The results of burner rig testing of Co-20Cr-12Al-0.5Y (EV-PVD)/Si type duplex coatings are reported.

62986 (EPRI-RD—2369-SR, pp 7.17-7.27) **Behavior of NiCrSi coating alloys in Na_2SO_4, V_2O_5, and mixed salt hot corrosion.** Corey, R.G.; Barkalow, R.H.; Khan, A.S.; Hecht, R.J. (Pratt and Whitney Aircraft Group, West Palm Beach, FL). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

The conversion of petroleum-fueled gas turbine power plants to low grade, residual oils or to coal-derived liquid fuels requires the development of turbine coatings capable of resisting both the hot corrosion and ash erosion effects due to vanadium, sulfur, and alkali metals in residual oils as well as the oxidation/interdiffusion degradation resulting from cleaner but hotter burning coal derived fuels. A program for evaluating candidate coating alloys is described. Furnace and burner rig testing has been devised to evaluate the behavior of the following alloys in Na_2SO_4, V_2O_5, and mixed salt hot corrosion: NiCrSi alloys of varying Cr and Si content; quaternary and active element additions to NiCrSi; Cr-base alloys; and Si-34Cr-23Ta. The results of oxidation tests of various alloys tested at 900°C and of hot corrosion tests at 815° and 900°C are presented. The high chromium, high silicon alloys which showed potential

for good resistance to vanadium-induced corrosion in these experiments will be evaluated. (LCL)

62987 (EPRI-RD—2369-SR, pp 7.45-7.68) **Development of diffusion bonded claddings for large gas turbine applications.** Wood, J.H.; Farrell, T.R.; Beltran, A.M.; Schilling, W.F.; Ostergren, W.J. (General Electric Co., Schenectady, NY). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

Since 1970, the General Electric Company's Gas Turbine Division has been investigating diffusion-bonded, corrosion-resistant sheet claddings as an alternate means of protecting gas turbine bucket airfoils from the corrosion encountered in the more severe service environments. The recent activity in this ongoing study is reviewed. The environmental resistance of several cladding alloys, including Co, Fe, and Ni-base compositions, was evaluated in burner rig testing under conditions of varying temperature and fuel contamination level. In general, the Ni-base alloy IN-671 was found to be most corrosion resistant at the lower temperature (i.e., 760°C), while the over-aluminided Co-base alloys, S-57 and PFB-6, were found to be superior at the higher temperatures. The Fe-base alloy GE-2541 proved to be intermediate in corrosion resistance in both test temperature regimes. These burner rig results have been corroborated quite well by the results of field testing of clad buckets. The over-aluminided S-57 alloy proved to be the best of the claddings after approximately 26,000 hours service at maximum temperatures which probably did not exceed 1550-1600°F. Unaluminided IN-617 was the poorest, while GE-2541 and over-aluminided IN-671 were intermediate in resistance. Finally, a study of the possible effects of claddings on mechanical properties was presented. Results obtained from computer modeling of cladding/substrate systems were shown to be in fairly good agreement with the available test data. Based on these results, claddings are expected to have minimal impact on clad bucket tensile and creep strain behavior; the maximum expected decrease in both tensile and creep strength for a clad MS7001 first stage bucket should not exceed approximately 2%. The environmental protection afforded by claddings may also have a beneficial effect on creep cracking behavior.

62988 (EPRI-RD—2369-SR, pp 7.83-7.104) **Turbine blade materials research at Sandia National Laboratories.** Benner, R.E.; Hamilton, J.C.; Nagelberg, A.S.; Mattern, P.L. (Sandia National Lab., Livermore, CA). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

Large payoffs are associated with increasing the operating temperature of gas turbines and using coal-derived fuels. Motivated by these possibilities, DOE/OBES is supporting programs at Sandia National Laboratories, Livermore, California, to develop and use new diagnostic techniques for the in-situ study of turbine blade materials and coatings. A major goal is to use the developed techniques to augment the present understanding of corrosion processes at elevated temperatures in realistic combustion environments. Turbine blade materials research at Sandia currently emphasizes the development of in-situ techniques for characterizing turbine blade materials and their service environments. For this purpose, spontaneous Raman spectroscopy has been demonstrated as a promising technique, especially when used in conjunction with complementary surface analysis methods. Future studies will be aimed at improving sensitivity and extending results to new alloy systems and varying environmental conditions. As the diagnostics-oriented program matures, the methods developed will be applied to specific materials problems with high potential payoff to energy-producing technology. At present, a good overlap is foreseen of the capabilities of Raman scattering with studies on thermal barrier coatings, structural alloys, molten salt attack, and deposition phenomena which may arise with higher service temperatures and the use of coal-derived fuels.

62989 (EPRI-RD—2369-SR, pp 7.105-7.118) **Rapidly solidified superalloys.** van Reuth, E.C.; Jacobson, L.A. (Defense Advanced Research Projects Agency, Arlington, VA). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

Superalloy powder processes have been successfully applied to the production of gas turbine engine disks through the superplastic forming operation known as Gatorizing, and disks made from hot isostatically pressed powder have also been developed and used. A new method of making superalloy powder, based on centrifugal atomization and helium gas quenching has opened up a new arena for superalloy improvement through additions of larger amounts of molybdenum and aluminum. The new technique, termed Rapid Solidification Rate, or RSR, gives cooling rates in the range of 10^5 to 10^{60}C/second and has stimulated a large amount of effort to apply rapid solidification processing to a number of other structural alloy systems, most notably, aluminum alloys. Currently active research programs on developing a fundamental understanding of these alloys and the development of the process are discussed. (LCL)

62990 (EPRI-RD—2369-SR, pp 7.119-7.134) **Development of a directionally solidified composite industrial gas turbine airfoil.** Schilling, W. (General Electric, Schenectady, NY); Fairbanks, J. May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

The Department of Energy is supporting a program at the General Electric Company to develop the techniques of bonding a turbine airfoil section to a powder metallurgy dovetail. This approach allows optimization of the high tensile strength and ductility requirements in the root to wheel attachments and the high temperature creep-rupture strength, thermal fatigue resistance and high temperature oxidation. Thus, each of the two sections is optimized without the current compromises with conventionally cast blades. Successful bonding techniques would have the growth potential to single crystal alloys. Also, if hot-corrosion/erosion is a more severe problem with any of the coal derived liquid or coal slurry fuels, a DS alloy can be developed to improve engine life. Bonding techniques also allow fabrication of the airfoil section using complex turbine blade cooling schemes such as the wafer blade concept or a clam shell scheme that could not be done with a large single piece conventionally cast blade. In addition, if erosion becomes a severe problem with coal slurry fuels an erosion resistant leading edge might be bonded. Thus, the bonding approach can provide considerable range of improvements in the industrial gas turbine, not only the airfoil section bonded to the root attachment but also bonding of segments of the airfoil. The big objective is to take advantage of DS airfoils in large industrial gas turbine engines to enhance operation on coal base fuels. Progress to date in the development of the vacuum investment casting technology for large gas turbine components, the bonding of superalloys using hot isostatic pressing (HIP), and the testing of cast and bonded alloy combinations is discussed. (LCL)

62991 **(KFK-CAD—185) Digital simulation of power electronic systems.** Mehring, P.; Jentsch, W.; John, G.; Kraemer, D. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.)). Jan 1981. 83p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82750616.

The following paper contains the final report on the NETSIM-Project. The purpose of this project is to develop a special digital simulation system, which could serve as a base for routine application of simulation in planning and development of power electronic systems. The project is realized in two steps. First a basic network analysis system is established. With this system the basic models and methods in treating power electronic networks could be probed. The resulting system is then integrated into a general digital simulation system for continous systems (CSSL-System). This integrated simulation system allows for convenient modeling and simulation of power electronic systems.

62992 **(ORNL/TM—8219/R1) User's guide to the AIM computer program package.** Hudson, C.R. II. (Oak Ridge National Lab., TN (USA)). Sep 1982. Contract W-7405-ENG-26. 21p. NTIS, PC A02/MF A01. Order Number DE83000381.

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A series of interactive computer programs has been developed to assess and rank any number of availability improvement al-

ternatives. This program package is based on the Availability Improvement Methodology (AIM) developed by Trident Engineering Associates. This guide provides information on how to run the programs and how they are configured.

62993 **Promising 2 GW turboset for nuclear power plants.** Safonov, L.P.; Nisnevic, V.I.; Bakuradze, M.W.; Kosjak, Ju.F.; Arkadjev, B.A.; Kantemir, A.D. *Archiv fuer Energiewirtschaft;* 36: No. 2, 129-136(Feb 1982). (In German).

In cooperation with the Scientific Planning Department of the Central Research Institute for Vessel- and Turbine Building the construction office of the turbine factory Charkow finished the design of a slowly running ($n = 1500\ min^{-1}$) 2 GW-turboset for the operation of nuclear power plants. The chief purpose of the project was to determine the technical problems that occur during the development of such steam turbines, as well as to settle the most favourable design.

2002 Environmental Aspects

REFER ALSO TO CITATION(S) 62627, 62628, 62631, 62955, 63186

62994 **(EPRI-CS—2520) Entrainment in wet stacks. Final report.** Maroti, L.A. (Dynatech R/D Co., Cambridge, MA (USA)). Aug 1982. 216p. NTIS, PC A10/MF A01. Order Number DE82906487.

Portions of document are illegible.

The use of wet flue gas desulfurization systems on power plants has resulted in the widespread use of stack gas reheat systems to improve dispersion and to protect the downstream equipment from corrosion. Stack gas reheat systems are expensive and often ineffective in preventing the corrosion of downstream equipment. An alternative to the reheating of flue gas is the use of all wet stack systems. The disadvantage of wet stacks is the danger of corrosion and liquid discharge. The major difficulty in comparing these systems is the limited knowledge available on wet stack operations. The objectives of this analytic and experimental work were to generate new information on those factors that most affect wet stack operation such as stack diameter, flue gas velocity, and the flow of condensed liquid on typical liner materials. In addition, control methods for liquid discharge from wet stacks were investigated. The sources of liquid in a wet stack are mist-eliminator carry-over, condensation due to cooling by ambient air, and condensation due to adiabatic expansion along the height of the stack. The liquid deposits primarily on the duct and stack surfaces. This liquid can be reentrained by the shear of the gas flow. The amount and the droplet size distribution of the reentrained liquid were measured and found to be functions of the gas velocity and liner surface materials. For the control of stack liquid discharge, the following three objectives have to be achieved by the design and the operation of the wet stack system without reheat: Maximum deposition and separation of the liquid on the duct walls and stack liners; minimum reentrainment of the deposited liquid by the gas shear and turbulence; and good collection and protected drainage of the liquid from the stack system.

62995 **(EPRI-CS—2537) Materials testing in simulated flue-gas-desulfurization-duct environments. Final report.** Koch, G.H.; Beavers, J.A. (Battelle Columbus Labs., OH (USA)). Aug 1982. 71p. NTIS, PC A04/MF A01. Order Number DE82906485.

Corrosion of construction materials is a major cause of poor reliability and high costs associated with flue gas desulfurization systems. In particular, the outlet ducts which carry cooled scrubbed gas from the scrubber to the stack suffer severe corrosion. Accordingly, the Electric Power Research Institute (EPRI) has asked Battelle to evaluate alloys and linings in simulated outlet duct environments. Of the alloys tested, the nickel-based alloys HASTELLOY C-276, INCONEL 625, HASTELLOY G, and the iron-based alloy AL 6X, showed none or very little pitting; this resistance was attributed to their high molybdenum content. Also, titanium was found to be very resistant to the wet acidic environments. Significantly, the ferritic stainless steel Monit, which is a low cost material containing only 4.1 weight percent molybdenum, exhibited high resistance against pitting and uniform corrosion. The 300 series stainless steels showed deep pits and high corrosion rates. Generally, the linings showed good resistance under continuous exposure to the relatively low temperature wet acidic environments. However, a major shortcoming of the linings was found to be the lack of resistance to temperature upsets.

62996 **(PB—81-225773) EPA utility FGD (flue gas desulfurization) survey.** Smith, M.; Melia, M.; Gregory, N.; Scalf, K. (PEDCO-Environmental Specialists, Inc., Cincinnati, OH (USA)). Aug 1981. 308p. NTIS, PC A14/MF A01.

Information contributed by the utility industry, process suppliers, regulatory agencies, and consulting engineering firms is summarized. Domestic FGD systems are tabulated alphabetically by development status (operational, under construction, or in planning stages), utility company, process supplier, process and waste disposal practice. Data on boiler design, FGD system design, fuel characteristics, and actual performance are presented. Unit by unit dependendability parameters, and problems and solutions associated with the boiler and FGD systems are discussed. Process flow diagrams and FGD system economic data are also presented.

2003 Power Transmission And Distribution

REFER ALSO TO CITATION(S) 63201

62997 **(DOE/NBM—2022492) Cost estimating guidebook for interconnections between electric utilities and small power producers qualifying under PURPA. Draft.** (Argonne National Lab., IL (USA)). Aug 1982. Contract W-31-109-ENG-38. 62p. NTIS, PC A04/MF A01. Order Number DE82022492.

Portions of document are illegible.

Energy conservation is a prime concern of every progressive country in the world today, and the future economic viability of every nation will depend on how well each manages and conserves its energy resources. In recognition of these conditions, the US Government has established policies to increase efficiency in energy use; increase development and utilization of domestic energy fuels; and encourage development and installation of small power-generating facilities that use renewable sources of energy as primary fuels. To improve the economic feasibility of small power-generating facilities, the Congress enacted Section 210 of the Public Utility Regulatory Policies Act of 1978 (PURPA), Public Law 95-617, 16 USC Section 824a-3. Section 210 provides certain incentives for the development of such facilities and gives the Federal Energy Regulatory Commission (FERC) the authority to exempt such facilities from most aspects of public utility regulation. The FERC rules implementing Section 210 of PURPA provide, among other things, that cogeneration and small power production facilities qualifying under Section 210 (QFs) have a right to interconnect with utilities for the purposes of selling power to and purchasing power from electric utilities. The cost of interconnection with the utility can be a key factor in deciding whether to install a small power-generating facility. This guidebook is designed to help potential electrical power producers estimate these costs.

62998 **(NP—27500XX) 1981 5-year plan.** (Statens Vattenfallsverk, Stockholm (Sweden)). Apr 1981. 105p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE82750061.

The Swedish State Power Board generates about 45 % of the electric power generated in the country. A five-year plan for research and development is produced annually. The R and D activities are broken down into five main areas, each of which comprises a number of programme fields. The economic resources assigned to the main areas and the programme fields throughout the five-years period amount to SEK 499 million. To handle the economic allocations the personnel required has been estimated to be about 700 man-years for the entire period. The main areas and programme fields are outlined below. 1. Energy conversion technology 1.1 Hydro-electric power technology 1.2 Nuclear power technology 1.3 Fossil-fired power technology 2. New energy technology and efficient energy utilisation 2.1 New energy sources 2.2 Energy storage 2.3 Efficient utilisation of energy 3. Electrotechnology 3.1 Transmission Lines/cables 3.2 Transmission - stations 3.3 Distribution 3.4 Generation 3.5 Control systems and auxiliary power systems 4. Electric energy systems 4.1 Planning of expansion 4.2

System operation 4.3 Reliability engineering 5. Building and materials technology 5.1 Technology and materials 5.2 Design 5.3 Construction and methods of working.

62999 **(SV-FUD—4-3) Method for the analysis of the subsynchronous resonance.** Bengtsson, J.-E.; Walve, K. (Statens Vattenfallsverk, Stockholm (Sweden)). Feb 1981. 35p. (In Swedish). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750058.

A method for the analysis of the risk of subsynchronous resonance is presented. Particular consideration has been paid to the torsional couplings between turbogenerators and the transmission lines. The method is used for network planning of the extension of transmission lines.

21 NUCLEAR POWER PLANTS

REFER ALSO TO CITATION(S) 62993

2101 Power Reactors, Non-breeding, Light-water Moderated, Boiling Water Cooled

REFER ALSO TO CITATION(S) 63028, 63049, 63057, 63059, 63060, 63066, 63069, 63070, 63072, 63073, 63074, 63081, 63082

63000 **(GSF-S—596) Measurement of actinide elements in the primary coolant of Gundremmingen nuclear power plant.** Rosner, G. (Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Neuherberg (Germany, F.R.). Inst. fuer Strahlenschutz). Jul 1979. 32p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750625.

Primary coolant, either directly or indirectly a potential source of radioactive effluents from nuclear power plants, has been analysed for actinide elements. For weekly primary coolant samples from the nuclear power plant Gundremmingen, from the years 1975 and 1976, concentration values are presented for Pu-239/40, Pu-238 and/or Am-241, Pu-241, Am-241, Cm-242, Cm-244, as well as for U-234, U-238 and Pu-242, and for the activity ratios Pu-238/Pu-239/240, Pu-241/Pu-239/240, and Am-241/Pu-238. Samples were prepared for counting either directly by evaporation or by chemical separation on BioRad AG 1x4 resin and subsequent electrolysis. Counting was done in 20-cm dia Frish-grid ionization chambers. The actinide mixture present in primary coolant is, concerning its elemental and isotopic composition, significantly different from the actinide mixture present in worldwide fallout. Its knowledge is of interest for studies of effluents and for subsequent radioecological investigation.

2102 Power Reactors, Non-breeding, Light-water Moderated, Non-boiling Water Cooled

REFER ALSO TO CITATION(S) 62773, 63028, 63059, 63063, 63065, 63066, 63068, 63070, 63072, 63073, 63074, 63076, 63078, 63079, 63080, 63083

63001 **(CONF-820951—1) Demonstration of a noise-surveillance system at a PWR.** Smith, C.M. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 3p. NTIS, PC A02/MF A01. Order Number DE82022265.

From NRC surveillance and diagnostics review group meeting; Rockville, MD, USA (20 Sep 1981).

The automated surveillance system has monitored the Sequoyah Nuclear Plant during its first fuel cycle. The system was able to acceptably adapt to different plant operating conditions. While evaluations are still ongoing, results indicate that the system was able to adapt to signals with different statistical character and that the discriminants are useful in detecting spectral changes. The system monitored long-term noise behavior, detected spectra that differ from what is considered normal, and provided concise storage of spectra together with the plant operating condition associated with the stored spectra.

63002 **(DOE/ET/34019—1) Development of a reactor-coolant pump monitoring and diagnostic system. Project management report, October 1980-November 1981.** Sommerfield, G.A.; Morris, D.J. (Toledo Edison Co., OH (USA); Babcock and Wilcox Co., Lynchburg, VA (USA). Nuclear Power Generation Div.). Feb 1982. Contract AC02-79ET34019. 39p. (BAW—1721). NTIS, PC A03/MF A01. Order Number DE82021059.

The objective of the project is to develop a reactor coolant pump monitoring and diagnostic system and collect sufficient data to permit analysts to determine why high outleakage and failures occur at Davis-Besse Nuclear Power Station, Unit 1. This report summarizes the work completed during the first period of performance, October 1, 1980, through November 30, 1981. During this period the members of the Project Team were selected and the detailed work management plans developed to take this project from conception, through detailed engineering, and finally to construction in the early part of 1982. The scope of work described includes system design, equipment selection for the computer-based data collection and diagnostic system, and computer software development to permit data collection and analysis.

63003 **(NUREG/CR—2824-Vol.1) Eddy-current inspection for steam-generator-tubing program quarterly progress report for period ending March 31, 1982.** Dodd, C.V.; Deeds, W.E.; McClung, R.W. (Oak Ridge National Lab., TN (USA)). Sep 1982. Contract W-7405-ENG-26. 8p. (ORNL/TM—8418-Vol.1). NTIS, PC A02/MF A01 - GPO.

Eddy-current methods provide the best in-service inspection of steam generator tubing, but these techniques can produce ambiguity because of the many independent variables that affect the signals. This development program has used mathematical models and has developed or modified computer programs to design optimum probes, instrumentation, and techniques for multifrequency multiproperty examinations. Interactive calculations and experimental measurements have been made with modular eddy-current instrumentation and a minicomputer. These establish the coefficients for the complex equations that define the values of the desired properties (and the attainable accuracy) despite changes in other significant variables. The computer programs for calculating the accuracy with which various properties can be measured indicate that the tubing wall thickness and the defect size can be measured much more accurately than is required, even when other properties vary.

2103 Power Reactors, Non-breeding, Graphite Moderated

REFER ALSO TO CITATION(S) 63061

63004 **(CONF-820915—4) Prestressed-concrete reactor-vessel research and development studies at the Oak Ridge National Laboratory.** Naus, D.J. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 6p. NTIS (US Sales Only). Order Number DE82022262.

From BNES international conference on gas cooled reactors today; Bristol, UK (20 Sep 1982).

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The Prestressed Concrete Reactor Vessel (PCRV) research and development program at the Oak Ridge National Laboratory (ORNL) consists of generic studies to provide technical support for ongoing PCRV activities, to contribute to the technological data base, and to provide independent review and evaluation of the relevant technology. Current activities conducted in support of the development of high-temperature gas-cooled reactors (HTGRs) include: analysis methods development, concrete property determination, model testing, and component testing.

63005 **(Juel—1731) Experimental investigations on the migrational behaviour of silver in coated particle fuel for high-temperature reactors.** Amian, W. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung). Aug 1981. 212p. (In German). NTIS (US Sales Only), PC A10/MF A01. Order Number DE82750499.

Thesis.

The migrational behaviour of silver in the coated particle fuel proposed for High-Temperature Reactors, is investigated experimentally. Data are described in the framework of the diffusion model. The diffussion coefficients are derived from the experimental data by a nonlinear least squares fit procedure. The experimental procedures and the theoretical calculations to analyse the data are described extensively. Arrhenius lines are presented for U(Th)-O_2, PyC and Sic. The silver release in advanced High-Temperature Reactors is prognosticated based on the measured data.

63006 **(ORNL/TM—8060) Chemical thermodynamics of iodine species in the HTGR fuel particle.** Lindemer, T.B. (Oak Ridge National Lab., TN (USA)). Sep 1982. Contract W-7405-ENG-26. 23p. NTIS, PC A02/MF A01. Order Number DE83000379.

The iodine-containing species in an intact fuel particle in the high-temperature gas-cooled reactor (HTGR) have been calculated. Assumptions include: (1) attainment of chemical thermodynamic equilibrium among all species in the open porosity of the particle, primarily in the buffer layer; and (2) fission-product concentrations in proportion to their yields. The primary gaseous species is calculated to be cesium iodide; in carbide-containing fuels, gaseous barium iodide may exhibit equivalent pressures. The condensed iodine-containing phase is usually cesium iodide, but in carbide-containing fuels, barium iodide may be stable instead. Absorption of elemental iodine on the carbon in the particle appears to be $\leqq 10^{-4}$ μg I/g C. The fission-product-spectra excess of cesium over iodine would generally be adsorbed on the carbon, but may form Cs_2MoO_4 under some circumstances.

2105 Power Reactors, Breeding

REFER ALSO TO CITATION(S) 62742, 63045, 63062, 63067, 63075, 63077, 63705

63007 **(CNEN-RT/MET—81-1) 9Cr-2Mo steel for fast reactor's steam generators.** Dalmastri, B.; Vacchiano, S.; Guglielmi, F.; Franzoni, U. (Comitato Nazionale per l'Energia Nucleare, Casaccia (Italy). Dipartimento Ricerca Tecnologica di Base e Avanzata). Oct 1981. 33p. (In Italian). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82905941.

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A composition-modified 9Cr-2Mo steel has been designed and studied. A lower impact transition temperature is obtained, while other mechanical properties (especially creep resistance) remain good. The paper describes the fabrication, processing and testing of a first 100 kg ingot, which will be followed by a larger one, in the frame of a research on steels for steam generators.

63008 **(CONF-820943—2) Water storage of liquid-metal fast-breeder-reactor fuel.** Meacham, S.A. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 10p. NTIS, PC A02/MF A01. Order Number DE82022269.

From ANS topical meeting - spent fuel storage; Savannah, GA, USA (26 Sep 1982).

Portions of document are illegible.

The purpose of this paper is to present a general overview of a concept proposed for receiving and storing liquid metal fast breeder reactor (LMFBR) spent fuel. This work was done as part of the Consolidated Fuel Reprocessing Program (CFRP) at the Oak Ridge National Laboratory (ORNL). The CFRP has as its major objective the development of technology for reprocessing advanced nuclear reactor fuels. The program plans that research and development will be carried through to a sufficient scale, using irradiated spent fuel under plant operating conditions, to establish a basis for confident projection of reprocessing capability to support a breeder industry.

63009 **(DOE/ET/37237—16) Fast Breeder Blanket Facility FBBF. Annual report, January 1, 1981-December 31, 1981.** Clikeman, F.M. (ed.). (Purdue Univ., Lafayette, IN (USA). School of Nuclear Engineering). Jul 1982. Contract AC02-76ET37237. 58p. (COO—2826-16; PNE—82-153). NTIS, PC A04/MF A01. Order Number DE82021044.

This annual report contains a summmary of fission rate, spectra, and gamma-ray heating rate measurements made in the first blanket of the Purdue Fast Breeder Blanket Facility. The first blanket consisted of aluminum clad, natural UO_2 fuel rods with a secondary cladding of stainless steel or aluminum. The blanket was arranged in two concentric regions around the neutron source and converter regions. A neutron diffusion code, 2DB, and a Monte Carlo code, VIM, both using homogeneous cross section groups have been used to calculate the reaction rates. Calculated to experimental values for a number of important reactions are presented. A modified method of applying Bondarenko self-shielding factors to correct for the self shielding of resonance energy neutrons in aluminum, stainless steel and UO_2 has improved the agreement between the calculations and experiment, but does not account for all of the differences.

63010 **(HEDL-TME—82-12) M1DX, a one-dimensional diffusion code for generating effective nuclear cross sections.** Mann, F.M. (Hanford Engineering Development Lab., Richland, WA (USA)). Sep 1982. Contract AC06-76FF02170. 54p. NTIS, PC A04/MF A01. Order Number DE83000106.

M1DX is a multipurpose, one-dimensional (plane, cylinder, sphere) diffusion theory code for use in fast reactor analysis. M1DX is a Merger of the HEDL H1DX and the LANL SUPERX codes, which are both based on 1DX. The code is designed to: compute k/sub eff/ and perform crticality searches on time absorption (α), reactor dimensions, and buckling by means of either a flux or an adjoint model; compute and output collapsed microscopic and macroscopic cross sections averaged over the spectrum in any specified zone; and compute and output resonance shielded cross sections using data in the Russian format.

63011 **(IAEA-CN—42/277) Design of the Clinch River Breeder Reactor Plant heterogeneous core.** Dickson, P.W. Jr.; Arnold, W.H. (Westinghouse Electric Corp., Oak Ridge, TN (USA). Advanced Reactors Div.). 1982. Contract AC15-76CL50003. 19p. (CONF-820914—3). NTIS, PC A02/MF A01. Order Number DE82021182.

From International conference on nuclear power experience; Vienna, Austria (13 Sep 1982).

The original core design for the Clinch River Breeder Reactor Plant (CRBRP) was a homogeneous core, as are essentially all of present day liquid metal fast breeder reactors. A study was undertaken to determine if a rearrangement of the core into a heterogeneous configuration, with fertile elements interspersed within the fueled zone, would improve the breeding ratio significantly without excessive adverse effects on other aspects of the design. The result of the study was that the heterogeneous concept improved not only the breeding ratio and doubling time, but also the control assembly worth, core restraint response, and the fuel cycle cost. This paper describes the design evolution and the major effects of the change from a homogeneous to a heterogeneous core in the Clinch River Breeder Reactor Plant.

63012 **Progress in the United States Liquid Metal Fast Breeder Reactor development program.** Longenecker, J.R. (US DOE, Washington, DC). *Proceedings, Intersociety Energy Conversion Engineering Conference;* **2**: 1589-1591(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

Determining the most-logical LMFBR program strategy that can bring the technology to a state of commercial readiness in a timely and cost-effective manner is discussed. Realizing the uncertainties in the need date for the LMFBR, an approach is described which will pursue a program during the next decade that builds on the existing program experience, and that will achieve results that provide the program flexibility to accommodate a range of commercial introduction dates.

63013 **Two-lump fission product model for fast reactor analysis.** Atefi, B. (BNL, Upton, NY 11973). *Transactions of the American Nuclear Society;* **38**: 659-661(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63014 **Experimental investigation into two-mechanism critical heat flux.** Carlson, R.D.; France, D.M.; Priemer, R. (ANL, Argonne, IL 60438). *Transactions of the American Nuclear Society;* **39**: 1047-1048(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63015 **Identification of ruptured fuel elements in subassemblies irradiated in EBR-II.** Villarreal, R.; Phipps, R.D. (ANL-Idaho, Argonne, IL 60439). *Transactions of the American Nuclear Society;* **35**: 209-210(1980). (CONF-801107—).

From ANS international conference; Washington, DC, USA (17 Nov 1980).

63016 **Fuel-cladding chemical interaction in mixed-oxide fuel at high burnup.** Lawrence, L.A.; Jost, J.W. (Westinghouse Hanford, Richland, WA 99352). *Transactions of the American Nuclear Society;* **35**: 211-212(1980). (CONF-801107—).

From ANS international conference; Washington, DC, USA (17 Nov 1980).

63017 **The effects of variations in fuel pellet composition and size on mixed-oxide fuel pin performance.** Makenas, B.J.; Baker, R.B.; Jensen, B.W. (Westinghouse Hanford, Richland, WA 99352). *Transactions of the American Nuclear Society;* **35**: 212-214(1980). (CONF-801107—).

From ANS international conference; Washington, DC, USA (17 Nov 1980).

2106 Power Reactors, Auxiliary, Mobile, Package, And Transportable

63018 **Shielding optimization studies for a space reactor system.** Palmer, R.G. (LANL, Los Alamos, NM 87545). *Transactions of the American Nuclear Society;* **39**: 764-765(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

2107 Regulation And Licensing

REFER ALSO TO CITATION(S) 63047

63019 **(NE-M—3-33T-Rev.-9-82) 2-1/4%-chromium, 1%-molybdenum alloy steel seamless tubes (ASME SA-213 with additional requirements).** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Sep 1982. 11p. Nuclear Standards Management Center, Oak Ridge, TN 37830.

This standard covers 2-1/4%-chromium, 1%-molybdenum alloy steel seamless tubes for use in heat exchangers and steam generators for nuclear and associated applications. Material shall conform to the requirements of ASME SA-213, Grade T22; to the requirements of the ASME Boiler and Pressure Vessel Code (ASME Code), Section III, Article NB-2000; and to the additional requirements of this standard.

63020 **(NE-M—3-4T-Rev.-9-82) Nickel-alloy seamless tubes (ASME SB-163 with additional requirements).** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Sep 1982. 9p. Nuclear Standards Management Center, Oak Ridge, TN 37830.

This standard covers nickel alloy seamless tubes for nuclear and associated applications. Material shall conform to the requirements of ASME SB-163; to the requirements of the ASME Boiler and Pressure Vessel Code (ASME Code), Section III, Article NB-2000; and to the additional requirements of this standard.

63021 **(NE-M—6-3T-Rev.-9-82) Alloy-steel bolting material for high-temperature service (ASME SA-193 with additional requirements).** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Sep 1982. 10p. Nuclear Standards Management Center, Oak Ridge, TN 37830.

This standard covers alloy steel bolting material (bar, bolts, screws, studs, and stud bolts) for nuclear and associated applications. Material shall conform to the requirements of ASME SA-193; to the requirements of the ASME Boiler and Pressure Vessel Code (ASME Code), Section III, Article NB-2000; to the requirements of NE E 8-18 for finished products; and to the additional requirements of this standard.

63022 **(NE-M—6-4T-Rev.-9-82) Alloy-steel nuts for bolting for high-pressure and high-temperature service (ASME SA-194 with additional requirements).** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Sep 1982. 9p. Nuclear Standards Management Center, Oak Ridge, TN 37830.

This standard covers alloy steel nuts for bolting for high-pressure and high-temperature service in nuclear and associated applications. This standard does not cover bar or other starting materials. The only implied special considerations for starting materials are that they be capable of passing the required tests when processed into finished products in accordance with this standard. Material shall conform to the requirements of ASME SA-194; to the requirements of the ASME Boiler and Pressure Vessel Code (ASME Code), Section III, Article NB-2000; to the requirements of NE E 8-18; and to the additional requirements of this standard.

63023 **(NE-M—1-6T-Rev.-8-82) Mild-steel electrodes for gas metal-arc welding (ASME SFA-5.18 with additional requirements).** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Aug 1982. 8p. Nuclear Standards Management Center, Oak Ridge, TN 37830.

This standard covers mild steel electrodes for gas metal-arc welding for nuclear and associated applications. Material shall conform to the requirements of ASME SFA-5.18; to the requirements of the ASME Boiler and Pressure Vessel Code (ASME Code), Section III, Article NB-2000; and to the additional requirements of this standard.

63024 **(NE-M—2-3T-Rev.-8-82) Carbon- and alloy-steel welding fittings (ASME SA-234 with additional requirements).** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Aug 1982. 12p. Nuclear Standards Management Center, Oak Ridge, TN 37830.

This standard covers carbon and alloy steel welding fittings for nuclear and associated applications. Material shall conform to the requirements of ASME SA-234; to the requirements of the ASME Boiler and Pressure Vessel Code (ASME Code), Section III, Article NB-2000; and to the additional requirements of this standard.

63025 **(NE-M—2-5T-Rev.-8-82) Austenitic stainless steel welding fittings (ASME SA-403 with additional requirements).** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Aug 1982. 12p. Nuclear Standards Management Center, Oak Ridge, TN 37830.

This standard covers austenitic stainless steel welding fittings for nuclear and associated applications. Material shall conform to the requirements of ASME SA-403; to the requirements of the ASME Boiler and Pressure Vessel Code (ASME Code), Section III, Article NB-2000; and to the additional requirements of this standard.

63026 **(NE-M—1-5T-4-82-Rev.) Welding rods and electrodes, surfacing (ASME SFA-5.13 with additional requirements).** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Apr 1982. 5p. Nuclear Standards Management Center, Oak Ridge, TN 37830.

This standard covers nickel and nickel-alloy bare and covered welding rods and electrodes for hard surfacing in nuclear and associated applications.

63027 **(NE-M—1-21T-3-82-Rev.) Consumable welding inserts.** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Mar 1982. 8p. Nuclear Standards Management Center, Oak Ridge, TN 37830.

This standard covers the manufacture of consumable welding inserts without restriction of size, shape, or form for use in nuclear and associated applications.

2108 Economics

REFER ALSO TO CITATION(S) 62707, 63107, 63112, 63113

63028 **(NUREG/CR—2844) Nonfuel operation and maintenance costs for large steam-electric power plants - 1982.** Myers, M.L.; Fuller, L.C.; Bowers, H.I. (Oak Ridge National Lab., TN (USA)). Sep 1982. Contract W-7405-ENG-26. 108p. (ORNL/TM—8324). NTIS, PC A06/MF A01 - GPO.

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Revised guidelines for 1982 are presented for estimating annual nonfuel operation and maintenance costs for large steam-electric power plants, specifically light-water-reactor plants and coal-fired plants. Previous guidelines were published in January 1979 in ORNL/TM-6467, A procedure for estimating nonfuel operation and maintenance costs for large steam-electric power plants. Estimates for coal-fired plants include the option of scrubbing for flue-gas desulfurization. A computer program, OMCOST, that covers all plant options is also revised.

22 NUCLEAR REACTOR TECHNOLOGY

2201 Theory And Calculation

REFER ALSO TO CITATION(S) 63703, 63726, 63730

63029 **(CNEN-RT/FIMA—81-3) Nodal approach to nonlinear stability in nuclear-reactor space dynamics.** Trombetti, T. (Comitato Nazionale per l'Energia Nucleare, Bologna (Italy). Dipartimento Tecnologie Intersettoriali di Base). Oct 1981. 25p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82905942.

Nuclear reactor stability via nodal kinetics equations is dealt with in this paper. Each reactor node can present a feedback effect due to the variation of the nodal power. Both the nonlinearity implied by the product of nodal power times nodal power feedback and the nonlinearity of the feedback dependence on power are taken into account. No limitation is set to the number, n., of nodes, and no symmetry condition to their coupling coefficient matrix. Both cases of nondelayed and delayed coupling are considered. Any number of delayed neutron precursor groups is admitted in all nodes. Nonlinear stability is discussed by developing a method which introduces the use of two semidefinite Lyapunov function(al)s. A numerical example with a nontrivial feedback (destabilizing feedback in one node) for which most previous nodal analysis methods fail is also given.

63030 **Neutron transport equation in a general curvilinear coordinate system.** Takahashi, H. (BNL, Upton, NY 11973). *Transactions of the American Nuclear Society;* **38**: 634-635(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63031 **Bounded limit for the Monte Carlo point flux estimator.** Grimesey, R.A. (EG&G Idaho, Idaho Falls, ID 83415). *Transactions of the American Nuclear Society;* **38**: 637-639(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63032 **ENDF/B-V actinide and fission product decay power.** England, T.R.; Wessol, D.E.; Wilson, W.B. (LANL, Livermore, CA 94550). *Transactions of the American Nuclear Society;* **38**: 651-654(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63033 **Overview of current resonance theory for fast reactor applications.** Hwang, R.N. (ANL, Argonne, IL 60439). *Transactions of the American Nuclear Society;* **38**: 663-664(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63034 **Experimental and calculational results of an irradiation experiment in EBR-II.** Cooper, J.H.; Gilai, D.; Laing, W.R.; Raman, S.; Stelson, P.H.; Walker, R.L.; Williams, M.L. (ORNL, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **38**: 669-671(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63035 **Calculated power distribution in EBR-II control rod below core.** Franklin, F.C.; Meneghetti, D. (ANL, Argonne, IL 60439). *Transactions of the American Nuclear Society;* **38**: 671-672(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63036 **Long-time behavior of a nuclear reactor.** Kaper, H.G. (Argonne National Lab., IL). pp 247-251 of Spectral theory of differential operators. Knowles, I.W.; Lewis, R.T. (eds.). Amsterdam, Netherlands; North-Holland Publishing Co. (1981). Contract W-31-109-ENG-38.

A fundamental problem of reactor physics is the determination of the long-time behavior of the neutron population in a nuclear reactor. In particular, one is interested in the question whether the total neutron density has a purely exponential behavior as $t \to \infty$. We formulate this problem as an abstract Cauchy problem, show that the solution is given by a semigroup, and investigate the asymptotic behavior of the semigroup.

2202 Components And Accessories

REFER ALSO TO CITATION(S) 63019, 63020, 63021, 63022, 63023, 63024, 63025, 63238

63037 **(NE-F—3-41T-12-81) In-place testing of HEPA filter systems by the single-particle, particle-size spectrometer method.** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Dec 1981. 23p. Nuclear Standards Management Center, Oak Ridge, TN.

This standard describes the procedure and equipment for in-place testing of HEPA filter systems by the single-particle, particle-size (SPPS) spectrometer method. This method provides the capability for evaluating the effectiveness (i.e., decontamination factor or DF) of systems consisting of one or more stages of HEPA filters against submicrometer aerosols in discrete particle-size ranges. It is particularly useful for testing of multi-stage HEPA filter installations and for testing of very large (50,000 cfm installed capacity) single-stage systems where it is desired to minimize the quantity of challenge aerosol required.

63038 **(NE-E—15-2NC-T-3-82-Rev.) Class 2 nuclear components (supplement to ASME Boiler and Pressure Vessel Code, Section III, Subsections NCA and NC).** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Mar 1982. 32p. Nuclear Standards Management Center, Oak Ridge, TN 37830.

This standard supplements the rules for constructing components that are covered by Subsections NCA and NC of the 1980 Edition of the ASME Boiler and Pressure Vessel Code, Section III. The NCA subsection covers general requirements, while NC covers requirements for Class 2 components: materials, design, fabrication and installation requirements, examination, and testing. (DLC)

63039 **(NE-E—15-2NB-T-3-82-Rev.) Class 1 nuclear components (supplement to ASME Boiler and Pressure Vessel Code, Section III, Subsections NCA and NB).** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Mar 1982. 37p. Nuclear Standards Management Center, Oak Ridge, TN 37830.

This standard supplements the rules for the construction of nuclear components covered by Subsection NCA and NB of the 1980 Edition of the ASME Boiler and Pressure Vessel Code, Section III. The NB subsection covers Class I components, material, bolts, welded joints, pipes, fabrication and installation requirements, examination, and testing. (DLC)

63040 **Future needs for inelastic analysis in design of high-temperature nuclear plant components.** Corum, J.M. (Oak Ridge National Lab., TN). *Computers and Structures;* **13**: 231-240(1981). Contract W-7405-ENG-26.

The purpose of this paper is to describe the role that inelastic analyses play in the design of high-temperature nuclear plant components and to identify the problem areas and needs. The design methodology, which explicitly accounts for nonlinear material deformation and time-dependent failure modes, requires a significant level of realism in the prediction of structural response. Thus, material deformation and failure modeling are, along with computational procedures, key parts of the methodology. Each of these is briefly discussed along with validation by comparisons with benchmark structural tests, and problem areas and needs are discussed for each.

2203 Fuel Elements

63041 **(CONF-820802—23-Draft) Reliability of the emergency ac-power system at nuclear power plants.** Battle, R.E.; Campbell, D.J.; Baranowsky, P.W. (Oak Ridge National Lab., TN (USA); JBF Associates, Knoxville, TN (USA); Nuclear Regulatory Commission, Rockville, MD (USA)). 19 Aug 1982. Contract W-7405-ENG-26. 12p. NTIS, PC A02/MF A01. Order Number DE82022336.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

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The reliability of the emergency ac-power systems typical of several nuclear power plants was estimated, the costs of several possible improvements was estimated. Fault trees were constructed based on a detailed design review of the emergency ac-power systems of 18 nuclear plants. The failure probabilities used in the fault trees were calculated from extensive historical data collected from Licensee Event Reports (LERs) and from operating experience information obtained from nuclear plant licensees. It was found that there are not one or two improvements that can be made at all plants to significantly increase the industry-average emergency ac-power-system reliability, but the improvements are varied and plant-specific. Estimates of the improvements in reliability and the associated cost are estimated using plant-specific designs and failure probabilities.

63042 (INIS-SU—38, pp 95-98) **Nondestructive express analysis of condition of protective coatings of fuel elements.** Koptev, M.A.; Kotlyarov, A.A.; Kravchuk, N.P. 1978. (In Russian). Dep. NTIS (US Sales Only).

In Experimental methods in nuclear physics. No. 3. Collection of scientific papers.

The technique of performing an express analysis of condition of protective coatings of heat-generating elements subjected to high-temperature testing is described. The integrity of element protective coatings can be judged on the quantity of gaseous fission products overflowing their envelope upon reactor short-term irradiation. For the purposes of the express analysis of protective coatings condition the set is used consisting of pneumatic system of sample supply, a system of gaseous fission products selection and gamma-spectrometer. The structure of the sampler system which comprises helium balloon (helium is used as a gas-carrier), sampler-flask filled with activated coal, Dewar vessel, flowmeter, manometer and sampler mechanism. By means of the installation considered gamma spectra of fission geseous products (xenon-138 and xenon-137) from the fuel element shell are obtained. By means of xenon-138 gas leakage through the fuel element coating is estimated. It equals to 0.85%.

63043 **(KFK—3100) Cladding temperature measurement by thermocouples at preirradiated LWR fuel rod samples.** Leiling, W. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Ingenieurtechnik; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Nukleare Sicherheit). Dec 1981. 110p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE82750500.

This report describes the technique to measure cladding temperatures of test fuel rod samples, applied during the in-pile tests on fuel rod failure in the steam loop of the FR2 reactor. NiCr/Ni thermocouples with stainless steel and Inconel sheaths, respectively,of 1 mm diameter were resistance spot welded to the outside of the fuel rod cladding. For the pre-irradiated test specimens, welding had to be done under hot-cell conditions, i.e. under remote handling. In order to prevent the formation of eutectics between zirconium and the chemical elements of the thermocouple sheath at elevated temperatures, the thermocouples were covered with a platinum jacket of 1.4 mm outside diameter swaged onto the sheath in the area of the measuring junction. This thermocouple design has worked satisfactorily in the in-pile experiments performed in a steam atmosphere. Even in the heatup phase, in which cladding temperatures up to 1050 °C were reached, only very few failures occured. This good performance is to a great part due to a careful control and a thorough inspection of the thermocouples.

63044 **Effect of spacer grids on post-CHF rod bundle heat transfer.** Morris, D.G.; Mullins, C.B.; Ott, L.J.; Yoder, G.L. Jr. (ORNL, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **39**: 1045-1047(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

2204 Control Systems

63045 **(CNEN-RT/ING—81-16) Evaluation of the effectiveness of some control algorithms for fast reactor cores.** Succi, S. (Comitato Nazionale per l'Energia Nucleare, Bologna (Italy). Dipartimento Reattori Veloci). Oct 1981. 84p. (In Italian). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82905928.

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The present paper deals with the surveillance system carried out for a sodium cooled fast breeder reactor core. The system is based on the manipulation of the coolant temperatures out of the fuel elements. Three different elaboration criteria on the measured temperature values are compared according to their ability of controlling the core behaviour. For one of the above criteria, a computer program (PRODOM) is presented, which identifies the accidents whose control is achievable.

63046 **On-line reactor coolant monitoring.** Mandler, J.W. (EG & G Idaho, Idaho Falls, ID 83415). *Transactions of the American Nuclear Society;* **39**: 836-837(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

2205 Environmental Aspects

REFER ALSO TO CITATION(S) 63000, 63072, 63486

63047 **(NUREG—0877) Final Environmental Statement related to license renewal and power increase for the National Bureau of Standards Reactor: Docket No. 50-184.** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation). Aug 1982. 95p. GPO $5.50.

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This Final Environmental Statement contains an assessment of the environmental impact associated with renewal of Operating License No. TR-5 for the National Bureau of Standards (NBS) reactor for a period of 20 years at a power level of 20 MW. This reactor is located on the 576-acre NBS site near Gaithersburg in Montgomery County, Maryland, about 20 mi northwest of the center of Washington, DC. The reactor is a high-flux heavy-water-moderated, cooled and reflected test reactor, which first went critical on December 7, 1967. Though the reactor was originally designed for 20-MW operation, it has been operating for 14 years at a maximum authorized power level to 10 MW. Program demand is now great enough to warrant operation at a power level of 20 MW. No additional major changes to the physical plant are required to operate at 20 MW.

2206 Research, Test, And Experimental Reactors

REFER ALSO TO CITATION(S) 63047

63048 **(DOE/ER/10727—T2) Ohio State University reactor-sharing program. Progress report, September 1, 1981-March 15, 1982.** (Ohio State Univ. Research Foundation, Columbus (USA)). 1982. Contract FG02-80ER10727. 13p. NTIS, PC A02/MF A01. Order Number DE82020139.

Six colleges and universities have participated in The Ohio State University Reactor Sharing Program from September 1, 1981 through March 15, 1982. Forty-three students supervised by eight faculty members have completed neutron activation analysis experiments, nuclear engineering laboratories, and have been introduced to nuclear research methods. Neutron activation analysis experiments have been completed by individuals from Wright State University, Ohio Northern University, and Bowling Green State University. Students from the Air Force Institute of Technology and the University of Cincinnati completed approach to critical and control rod calibration laboratories. Dennison University students performed a laboratory introducing them to neutron activation analysis techniques.

63049 **(EIR—448) Disassembly of decommissioned nuclear power plants: cutting research on test pieces of reinforced concrete and Baryte concrete with a wire saw.** Francioni, W.M. (Eidgenoessisches Inst. fuer Reaktorforschung, Wuerenlingen (Switzerland)). Oct 1981. 32p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82905933.

EIR studies are being made among other things of the breakdown of the biological shield of light water reactors and particularly the breakdown of the reactor island of the former research reactor DIORIT. In selecting a method for disassembly of the concrete structures the use of a wire saw has also been examined. To gain experience two concrete test pieces - representing respectively the concrete and reinforcement of the DIORIT biological shield and the biological shield of the Beznau nuclear plants - have undergone cutting trials. The results show that the wire saw can be economically used to cut not only Baryte concrete and cast iron (thermal shield of DIORIT) but also the reinforced concrete of Beznau.

63050 **(GKSS—81/E/55) Upgrading of the research reactors FRG-1 and FRG-2.** Krull, W. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)). 1981. 22p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82750619.

In 1972 for the research reactor FRG-2 we applied for a license to increase the power from 15 MW to 21 MW. During this procedure a public laying out of the safety report and an upgrading procedure for both research reactors - FRG-1 (5 MW) and FRG-2 - were required by the licensing authorities. After discussing the legal background for licensing procedures in the Federal Republic of Germany the upgrading for both research reactors is described. The present status and future licensing aspects for changes of our research reactors are discussed, too.

63051 **(HEDL-SA—2574-FP) Mechanical properties of highly irradiated 20 percent cold-worked Type 316 stainless steel.** Hamilton, M.L.; Cannon, N.S.; Johnson, G.D. (Hanford Engineering Development Lab., Richland, WA (USA)). 5 Apr 1982. Contract AC06-76FF02170. 13p. (CONF-820628—2). NTIS, PC A02/MF A01. Order Number DE82016262.

From 11. international symposium on effects of radiation on materials, American Society for Testing and Materials; Scottsdale, AZ, USA (28 Jun 1982).

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Recent experiments have extended the mechanical properties data base of 20 percent cold worked 316 stainless steel to a fluence of 1.3×10^{23} n/cm² (E > 0.1 MeV), the goal exposure of the Fast Flux Test Facility. Both uniaxial and biaxial tests were conducted on speciments of developmental cladding which were irradiated in the Experimental Breeder Reactor-II at temperatures ranging from 370°C to 650°C. Uniaxial tensile tests were conducted at strain rates ranging from 10^{-5}/s to 10^{-3}/s. Controlled Biaxial Strain Rate (CBSR) tests, recently developed at the Hanford Engineering Development Laboratory, were conducted only at a strain rate of 10^{-5}/s. CBSR specimens are gas-loaded to produce a constant diametral strain rate. These tests are otherwise analogous to uniaxial tensile tests. The tensile strength and ductility of the cladding were generally in good agreement with the predicted values.

63052 **Detailed Monte Carlo calculations for a hypothetical model of ZPR-6 assembly 7.** McKnight, R.D.; Shank, D.E. (ANL, Argonne, IL 60439). *Transactions of the American Nuclear Society;* **38**: 668(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63053 **HFEF North radiography station.** Adam, M.F.; Bailey, D.M.; Richards, W.J.; Stephens, W.E. (ANL-Idaho, Idaho Falls, ID 83401). *Transactions of the American Nuclear Society;* **39**: 968-969(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

2207 Plutonium And Isotope Production Reactors

63054 **(DP-MS—82-13) Free convection in a partially submerged fluid loop.** Britt, T.E.; Wood, D.C. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 1982. Contract AC09-76SR00001. 31p. (CONF-821101—5). NTIS, PC A03/MF A01. Order Number DE82016267.

From ASME winter annual meeting; Pheonix, AZ, USA (14 Nov 1982).

Portions of document are illegible.

Several natural convection loop systems are studied in order to determine the operational characteristics for a multiple loop container which is used to cool failed nuclear reactor assemblies. Both analytical and experimental studies were undertaken to examine flow in both circular and rectangular flow loops. It was found that when a circular loop is heated at the bottom and cooled at the top, recirculation cells form at all input power fluxes. At fluxes between 0.1 W/cm² and 0.7 W/cm² the cells caused flow oscillations and reversals. With the circular loop heated from the side, no recirculation cells were observed at the power fluxes up to 1.5 W/cm. Boiling did not occur in the circular loop. For a rectangular loop heated and cooled on its vertical sides, no recirculation cells or flow reversals were seen. At input power fluxes above 1.2 W/cm², periodic boiling in the heated side caused flow oscillations.

2208 Propulsion Reactors

63055 Nuclear electric power for space systems: technology background and flight-systems program. Bennett, G.L.; Lombardo, J.J.; Rock, B.J. (US DOE, Washington, DC). *Proceedings, Intersociety Energy Conversion Engineering Conference;* **1**: 362-368(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

Currently, DOE is developing radioisotope thermoelectric generators (RTGs) for the NASA Galileo mission and the International Solar Polar Mission. This paper surveys past and future uses of RTGs as well as the related dynamic isotope power system (DIPS) which was developed for power levels up to 2 kWe and the space nuclear reactor power plant which will cover the 10- to 100-kWe power range and is in the technology development phase. 7 refs.

63056 Acceptability of reactors in space. Buden, D. (Los Alamos National Lab., NM). *Proceedings, Intersociety Energy Conversion Engineering Conference;* **1**: 278-287(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

Reactors are discussed relative to future expansion into space. However, there has been some confusion in the public as to whether they are a safe and acceptable technology for use in space. The answer to these questions is explored.

2209 Reactor Safety

REFER ALSO TO CITATION(S) 63110

63057 (BF-R—64-167-40-2) Experiments on the pressure relief in a model reactor pressure vessel with internals at BWR conditions. Kanzleiter, T. (Battelle-Institut e.V., Frankfurt am Main (Germany, F.R.)). Oct 1981. 42p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82905950.

Portions of document are illegible.

Satisfactory post-test calculation of the BWR depressurization experiments covered by the BMFT project 150 396 requires more exact information on the stationary starting conditions than had initially been assumed. To obtain the initial void disribution within the core barrel, for example, it is necessary to determine the heat flux in the interior of the pressure vessel fairly exactly by balance considerations. The results of the present loop Experiment L16 are to substantiate and supplement previous investigations in this respect.

63058 (BNL-NUREG—31678) FRANTIC II application to standby safety systems. Ginzburg, T.; Boccio, J.L.; Hall, R.E. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 6p. (CONF-821103—22). NTIS, PC A02/MF A01.

From American Nuclear Society winter meeting; Washington, DC, USA (14 Nov 1982).

In the quantitative assessment of system reliability, it is predominantly important to check whether sufficient agreement exists between what is observed and what inherent limitations the assumed models possess. Time dependent hazard rate and time dependent unavailability models, such as FRANTIC II, enable one to take into account burn-in and wear-out, surveillance testing benefit, quantitative balancing of the advantages and disadvantages of accomplishing a particular testing program in the context of the entire system's safety function. This paper shows the FRANTIC II model's capability to obtain realistic evaluation of the standby safety system unavailability utilizing time dependent unavailability analysis.

63059 (CONF-820802—22) Vaporization of structural materials in severe accidents. Lorenz, R.A. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 9p. NTIS, PC A02/MF A01. Order Number DE82020932.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

Vaporized structural materials form the bulk of aerosol particles that can transport fission products in severe LWR accidents. As part of the Severe Accident Sequence Analysis (SASA) program at Oak Ridge National Laboratory, a model has been developed based on a mass transport coefficient to describe the transport of materials from the surface of a molten pool. In many accident scenarios, the coefficient can be calculated from existing correlations for mass transfer by natural convection. Data from SASCHA fuel melting tests (Karlsruhe, Germany) show that the partial pressures of many of the melt components (Fe, Cr, Co, Mn, Sn) required for the model can be calculated from the vapor pressures of the pure species and Raoult's law. These calculations indicate much lower aerosol concentrations than reported in previous studies.

63060 (EPRI-NP—1525-Vol.5) BWR refill-reflood program CCFL/Refill System Effects Tests (30° Sector) Experimental Task Plan. Volume 5. BWR/4 ECCS geometry. Schumacher, D.G. (General Electric Co., San Jose, CA (USA)). Aug 1982. 34p. (NUREG/CR—1846; GEAP—24893). NTIS, PC A03/MF A01. Order Number DE82906482.

Volume 5 of the 30° Sector Experimental Task Plan provides definition of objectives, specific test conditions, and summarized test operating procedures for separate effect and system tests performed in the 30° Steam Sector Test Facility (30° SSTF) with low pressure coolant injection (LPCI) location and low pressure core spray (LPCS) geometry representative of BWR/4 configuration.

63061 (Juel-Spez—136(Bd.1)) Safety study for HTR concepts under German site conditions. Main volume for phase I B. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Nukleare Sicherheitsforschung). Dec 1981. 290p. (In German). NTIS (US Sales Only), PC A13/MF A01. Order Number DE82750635.

Within the spectrum of accidents, core heat-up, caused by failure of the power supplies to the reactor or by interruption of the cooling system, is of major significance. This accident causes no serious effects to the environment if the reactor containment building remains intact; however, in certain infrequent events the containment building could fail due to overpressure after about one week at the earliest and a significant environmental hazard would ensue. The other accidents - depressurisation, water and air ingress - are by comparison of distinctly lower importance to the overall risk. A common feature of all the significant accidents is that within the first five hours the maximum release of radioactivity to the reactor containment building is the inventory of the primary circuit, while the fission product inventory of the core is securely retained. The accidents investigated are characterised in the study by the probability of occurrence, by the types and quantities of the fission products released and by the period of release. It was stipulated that in this phase of the study the health risk to the neighbouring population should not be determined. However, the estimated quantities of released nuclides and their associated time of release lead to the conclusion that the worst possible damage to the environment is very limited. This arises from the inherent safety characteristics of the HTR and the comparatively long period available for counter measures.

63062 (LA—9436-MS) Intersubassembly fuel penetration into a failed blanket subassembly. DeVault, G.P.; Bell, C.R. (Los Alamos National Lab., NM (USA)). Aug 1982. Contract W-7405-ENG-36. 67p. NTIS, PC A04/MF A01. Order Number DE82021255.

This work provides additional understanding of hypothetical core-disruptive accident issues involving LMFBRs. Intersubassembly molten fuel and steel penetration into a failed blanket subassembly was analyzed with the two-dimensional SIMMER-II code. Interaction of the fuel and steel with the blanket coolant was included in the investigation. The molten core material was injected through a prescribed opening in the blanket subassembly wall. Eighteen cases involving variations of parameters of importance to the subsequent flow were calculated. In general the resulting pressurization was a good figure of merit for rating the severity of the events. In turn, the pressurization depended on the wall opening size, the initial pool pressure, and the heat-transfer rates. However, only when the wall failure rate was large relative to the sodium expulsion rate,

was sufficient pressure generated that could affect the reactor vessel containment.

63063 **(LA-UR—82-1483) Numerical-solution package for transient two-phase-flow equations.** Mahaffy, J.H.; Liles, D. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 13p. (CONF-821106—1). NTIS, PC A02/MF A01. Order Number DE82015803.

From Annual meeting of heat transfer and energy conversion; Los Angeles, CA, USA (14 Nov 1982).

The methods presented have proven to be extremely reliable tools for reactor safety analysis. They can handle a wide range of fluid conditions and time scales with minimal failures, while maintaining time step sizes well above those possible with most other techniques. This robustness is due not only to the finite-difference equations themselves, but also to the choice of solution technique, because poorly chosen iterative solution procedures often require a limit on the time-step size for proper convergence of the iteration.

63064 **(LBL—14247) Kinetics of laser-pulse vaporization of uranium dioxide by mass spectrometry.** Tsai, C.; Olander, D.R. (Lawrence Berkeley Lab., CA (USA)). Mar 1982. Contract W-7405-ENG-48. 9p. (CONF-821103—1). NTIS, PC A02/MF A01. Order Number DE82014473.

From American Nuclear Society winter meeting; Washington, DC, USA (14 Nov 1982).

Safety analyses of nuclear reactors require knowledge of the evaporation behavior of UO_2 at temperatures well above the melting point of 3140 K. In this study, rapid transient heating of a small spot on a UO_2 specimen was accomplished by a laser pulse which generates a surface temperature excursion. This in turn vaporizes the target surface and the gas expands into vacuum. The surface temperature transient was monitored by a fast-response automatic optical pyrometer. A computer program was developed to simulate the laser heating process and calculate the surface temperature evolution. A quadrupole mass spectrometer was used to identify and analyze the major vapor species in the vaporizing flow, and to measure the rate of evaporation from the target surface. The information yielded the partial vapor pressure of each species and the composition in the vapor jet. The maximum surface temperatures investigated range from $\sim$ 3700 K to $\sim$ 4300 K.

63065 **(NUREG/CR—2738) Experiment data report for Semiscale Mod-2A Intermediate Break Test Series (Test S-IB-3).** Sackett, K.E.; Clegg, L.B. (EG and G Idaho, Inc., Idaho Falls (USA)). Jun 1982. Contract AC07-76ID01570. 50p. (EGG—2198). NTIS PC E04/MF A01.

Includes 2 sheets of 48 x reduction microfiche. Portions of document are illegible.

This report presents test data recorded for Test S-IB-3 of the Semiscale Mod-2A Intermediate Break Test Series. This test is one of a series of Semiscale tests investigating thermal-hydraulic phenomena resulting from a hypothesized loss-of-coolant accident (LOCA) in a pressurized water reactor (PWR) system. These tests provide experimental data for assessing the analytical capability of computer codes used in LOCA analysis. The primary objective of Test S-IB-3 was to provide reference data for comparison of Semiscale test results with those from the LOBI B-RIM test conducted in the Loop Blowdown Investigation Facility at Ispra, Italy. Test IB-3 will also expand the break data base in the 10 to 200% range. Test S-IB-3 was conducted from initial conditions closely approximating the specified initial conditions: system pressure, 15.5 MPa; cold leg temperature, 563° K; and core power level, 1.44 MW. This report presents the uninterpreted data, mostly in microfiche form.

63066 **(NUREG/CR—2855) Subchannel analysis of multiple CHF events.** Reddy, D.G.; Fighetti, C.F. (Columbia Univ., New York (USA). Dept. of Chemical Engineering). Aug 1982. Contract AC02-76CH00016. 161p. (BNL-NUREG—51570). GPO $6.50.

Portions of document are illegible.

The phenomenon of multiple CHF events in rod bundle heat transfer tests, referring to the occurrence of CHF on more than one rod or at more than one location on one rod is examined. The adequacy of some of the subchannel CHF correlations presently used in the nuclear industry in predicting higher order CHF events is ascertained based on local coolant conditions obtained with the COBRA IIIC subchannel code. The rod bundle CHF data obtained at the Heat Transfer Research Facility of Columbia University are examined for multiple CHF events using a combination of statistical analyses and parametric studies. The above analyses are applied to the study of three data sets of tests simulating both PWR and BWR reactor cores with uniform and non-uniform axial heat flux distributions. The CHF correlations employed in this study include: (1) CE-1 correlation, (2) B and W-2 correlation, (3) W-3 correlation, and (4) Columbia correlation.

63067 **(NUREG/CR—2922) Comparison of quick predictions with results of selected, recent aerosol-behavior experiments.** Jordan, H.; Schumacher, P.M.; Gieseke, J.A. (Battelle Columbus Labs., OH (USA)). Sep 1982. 38p. (BMI—2099). GPO $4.50.

A detailed comparison of QUICK aerosol behavior code predictions with four representative experiments (AB-1, AB-3, NSPP-104, NSPP-203) is presented. It is shown that the three sodium fire experiments of this set can be used to evaluate and confirm values of the two aerosol particle shape factors for these systems ($x = 1.3$, $\gamma = 5.0$). In addition, it is shown that uncertainty in prediction due to uncertainty in the two shape factor is not augmented in translation from experimental to full scale. While the single uranium experiment suggests the doublet $x = 3.0$, $\gamma = 15.0$, these values are more equivocal since for this system wall plate-out is a significant factor. Large uncertainty in plate-out data resulted in concomitant uncertainty in the fitted values of the shape factors.

63068 **(ORNL/CSD/TM—193) Nuclear-criticality-safety studies of interest to TMI-2 recovery operations.** Thomas, J.T. (Oak Ridge National Lab., TN (USA)). Oct 1982. Contract W-7405-ENG-26. 22p. NTIS, PC A02/MF A01. Order Number DE83000423.

A series of criticality calculations was made on simple systems representative of possible situations that may be found during recovery operations at TMI-2. While not specific to physical conditions that may be encountered, the effect of oxide fines on the neutron multiplication factor may be estimated from the relative effects observed in the systems studied.

63069 **(SAND—82-0403C) Risk assessment of filtered-vented containment options for a BWR Mark III containment.** Harper, F.T.; Benjamin, A.S. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 9p. (CONF-820802—25). NTIS, PC A02/MF A01. Order Number DE82020974.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

Portions of document are illegible.

The risk reduction achievable in a Mark III containment boiling water reactor (Grand Gulf) by incorporating various types of containment venting systems, as well as other severe accident safety systems is evaluated. Risk reduction factors of up to 100 were calculated for certain containment venting options. Achievement of this risk reduction potential was found to be dependent upon several factors, including: (1) availability of a service water tie-in to replenish water supplies; (2) ability of the venting system to handle ATWS accidents; (3) ability to eliminate hydrogen burns after significant risk reduction has already taken place; and (4) assumptions made regarding phenomenological uncertainties. The use of high-efficiency filtering media was found to be unnecessary.

63070 **(SAND—82-0882C) Value and impact of alternative decay-heat-removal concepts.** Berry, D.L.; Sanders, G.A. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 9p. (CONF-821104—1). NTIS, PC A02/MF A01. Order Number DE82014504.

From 2. international conference on nuclear technology transfer; Buenos Aires, Argentina (1 Nov 1982).

At the request of the United States Nuclear Regulatory Commission (NRC) in April 1979, Sandia National Laboratories undertook a study of the value and impact of alternative decay heat removal concepts for light water reactor nuclear power plants. This work was prompted by a belief that some nuclear power plants may have decay heat removal system vulnerabilities which can sig-

nificantly contribute to risk. This paper presents the results of the Sandia study.

63071 **(SAND—82-1519C) Post-test examinations of the in-pile molten-pool experiments.** Hitchcock, J.T.; Kelly, J.E. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 4p. (CONF-821103—6). NTIS, PC A02/MF A01. Order Number DE82018746.

From American Nuclear Society winter meeting; Washington, DC, USA (14 Nov 1982).

Portions of document are illegible.

The in-pile molten pool experiments performed at SNL have been disassembled and post-test metallographic examinations have been conducted. These experiments are part of the Sandia PAHR program and have as their main objective the determination of the physical behavior, thermal characteristics and material interactions of dry debris beds. These characteristics and interactions are important for assessing the threat to containment from reactor debris. The disassembly effort and post-test examinations have revealed the extent and location of sintering and melt zones in the fuel debris and interactions with structural and candidate core retention materials. The molten pool program contains both in-pile and complementary out-of-pile tests. Five in-pile tests have been performed in this series. In these tests, either pure UO_2 or mixed UO_2/steel particulate beds were fission heated to simulate decay heat power levels.

63072 **(SAND—82-1595C) Potential impact of LWR source-term magnitude and characteristics on predicted consequences of reactor accidents.** Alpert, D.J. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 8p. (CONF-821103—5). NTIS, PC A02/MF A01. Order Number DE82018745.

From American Nuclear Society winter meeting; Washington, DC, USA (14 Nov 1982).

This paper will review the important characteristics of LWR accident source terms and discuss how each characteristic could impact predicted consequences. Information is presented concerning source term magnitude; particle size distribution and chemical composition; plume heat and moisture content; and release timing.

63073 **(SAND—82-1697C) Risk-reduction analysis of severe-accident prevention and mitigation systems.** Hatch, S.W.; Bennett, P.R.; Drayer, D.D.; Benjamin, A.S. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 10p. (CONF-820802—24). NTIS, PC A02/MF A01. Order Number DE82020986.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

Portions of document are illegible.

The Nuclear Regulatory Commission (NRC) is currently addressing the problem of how regulations might be changed to include consideration of degraded core accidents. In support of this, the Severe Accident Risk Reduction Program is being performed to assess the benefits and impacts of a set of degraded core safety features. This paper describes some initial results of Phase I of the program which includes estimates of the effects which various preventive and mitigative safety features have on the frequencies and consequences of core melt accidents for six reference reactors.

63074 **(SAND—82-1930C) Analysis of station blackout accidents for LWRs.** Kolaczkowski, A.M.; Payne, A.C. Jr.; Baranowsky, P.W. (Sandia National Labs., Albuquerque, NM (USA); Nuclear Regulatory Commission, Washington, DC (USA)). 1982. Contract AC04-76DP00789. 10p. (CONF-820802—26). NTIS, PC A02/MF A01. Order Number DE82020987.

From International meeting on thermal nuclear reactor safety; Chicago, IL, USA (29 Aug 1982).

Station Blackout, the loss of all ac power in a nuclear power plant, is a Nuclear Regulatory Commission (NRC) unresolved safety issue. This paper summarizes station blackout accident sequence analyses conducted as part of a plan to resolve this issue. The results covered include: (a) core damage probabilities for four generic classes of plants, (b) factors most affecting these probabilities, (c) containment failure insights, and (d) examples of sensitivity analyses to cover other variations of plant design.

63075 **(WAPD-TM—1505) WADER: a computer program for waterlogging analysis of defected fuel rods (LWBR development program).** Chao, T.L.; Wilczynski, R. (Bettis Atomic Power Lab., Pittsburgh, PA (USA)). Aug 1982. Contract AC11-76PN00014. 83p. NTIS, PC A05/MF A01. Order Number DE82022543.

The WADER computer program is used for analysis of waterlogged fuel rods with nonuniform axial power distributions. WADER calculates the rod internal pressures and cladding stresses as functions of fuel rod parameters, power level, and rate of power increase for a given through-cladding defect. Results from the analysis include maximum permissible step size of power increase to avoid exceeding a cladding stress limit and internal pressure buildup for a given rate of power increase and given defect size. Comparison of WADER predictions with experimental data from in-reactor and out-of-reactor tests is given. WADER predictions show reasonable agreement with the trend of experimental data.

63076 **Nuclear reactor safety research since Three Mile Island.** Mynatt, F.R. (Oak Ridge National Lab., TN). *Science (Washington, D.C.);* **216**: No. 4542, 131-135(9 Apr 1982). Contract W-7405-ENG-26.

The Three Mile Island nuclear power plant accident has resulted in redirection of reactor safety research priorities. The small release to the environment of radioactive iodine-13 to 17 curies in a total radioactivity release of 2.4 million to 13 million curies-has led to a new emphasis on the physical chemistry of fission product behavior in accidents; the fact that the nuclear core was severely damaged but did not melt down has opened a new accident regime-that of the degraded core; the role of the operators in the progression and severity of the accident has shifted emphasis from equipment reliability to human reliability. As research progresses in these areas, the technical base for regulation and risk analysis will change substantially.

63077 **Contributions concerning quasi-steady propagation of thermal detonations through dispersions of hot liquid fuel in cooler volatile liquid coolants.** Condiff, D.W. (Argonne National Lab., IL). *International Journal of Heat and Mass Transfer;* **25**: No. 1, 87-98(1982).

The two-phase flow model of 1-dim. propagation of thermal detonation is reformulated to permit isolation of both new and existing conclusions which are independent of fragmentation kinetics data. The two-phase flow model is found to be necessary for making quantitive predictions of detonation strength in hydrodynamic fragmentation. A wide spectrum of kinetics-independent permissible Chapman-Jouguet states is found possible for any specific initial conidition in calculations for the UO_2-sodium system, with sensitivity of these (C-J) states found to initial sodium (coolant) vapor blanket volume fraction. Arguments are presented which suggest our use of an equilibrium sonic velocity for C-J wave termination. The abrupt decrease of sonic velocity due to the presence of vapor or gas is found to be sufficiently severe as to render vaporization unlikely either in the steady detonation zone or at the C-J plane, and further identifies a lower threshold for thermodynamically permissable C-J propagations which occurs at coolant saturation.

63078 **ATWS calculation for B & W plants in the event of LOFW/SOSW.** Liu, J.S.K.; Collier, R.P. (BCL, Columbus, OH 43201). *Transactions of the American Nuclear Society;* **38**: 437-438(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63079 **Analysis of steam-line-break-induced steam generator tube rupture.** Dobranich, D. (LANL, Los Alamos, NM 87545). *Transactions of the American Nuclear Society;* **38**: 438-440(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63080 **Bleed-and-feed recovery for PWR transients involving auxiliary feedwater unavailability.** Henninger, R.J.; DeMuth, N.S. (LANL, Los Alamos, NM 87545). *Transactions of the American Nuclear Society;* **38**: 440-441(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63081 **Effect of pressure and flow on the BWR rod drop accident.** Cheng, H.S.; Lu, M.S.; Diamond, D.J. (BNL, Upton, NY 11973). *Transactions of the American Nuclear Society;* **38**: 441-442(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63082 **Analysis of BWR anticipated transients without scram with steam line dynamics and space-time kinetics effects.** Lu, M.S.; Shier, W.G.; Levine, M.M. (BNL, Upton, NY 11973). *Transactions of the American Nuclear Society;* **38**: 442-443(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63083 **Effect of debris/water interaction on overpressurization of a PWR containment.** Ynag, J.W. (BNL, Upton, NY 11973). *Transactions of the American Nuclear Society;* **38**: 446(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63084 **Meteorological data for reactor accident risk calculations.** Alpert, B.J.; Aldrich, D.C.; Ostmeyer, R.M. (Sandia, Albuquerque, NM 87185). *Transactions of the American Nuclear Society;* **39**: 122-124(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63085 **International standards and nuclear safety.** Smith, D.R. (LANL, Los Alamos, NM 87545). *Transactions of the American Nuclear Society;* **39**: 543-544(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63086 **Quenching of a high-temperature particle bed.** Armstrong, D.R.; Chan, S.H.; Cho, D.H.; Thomas, G.R. (ANL, Argonne, IL 60439). *Transactions of the American Nuclear Society;* **39**: 1048-1049(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63087 **Interfacial heat transfer between overlying liquid layers with gas agitation.** Green, G.A.; Schwarz, C.E. (BNL, Upton, NY 11973). *Transactions of the American Nuclear Society;* **39**: 1050-1051(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

25 ENERGY STORAGE

2506 Thermal

REFER ALSO TO CITATION(S) 62919, 62921

63088 **(PNL—4260) Multi-dimensional finite-element code for the analysis of coupled fluid energy, and solute transport (CFEST).** Gupta, S.K.; Kincaid, C.T.; Meyer, P.R.; Newbill, C.A.; Cole, C.R. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 93p. NTIS, PC A05/MF A01. Order Number DE82022521.

The Seasonal Thermal Energy Storage Program is being conducted for the Department of Energy by Pacific Northwest Laboratory. A major thrust of this program has been the study of natural aquifers as hosts for thermal energy storage and retrieval. Numerical simulation of the nonisothermal response of the host media is fundamental to the evaluation of proposed experimental designs and field test results. This report represents the primary documentation for the coupled fluid, energy and solute transport (CFEST) code. Sections of this document are devoted to the conservation equations and their numerical analogues, the input data requirements, and the verification studies completed to date.

2508 Chemical

REFER ALSO TO CITATION(S) 62801

63089 **(NP—2905797) Thermochemical analysis of hydrates.** Grimme, F.W. (Technische Hochschule Aachen (Germany, F.R.). Fakultaet fuer Bergbau und Huettenwesen). 26 Sep 1979. 41p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82905797.

Thesis.

The design of a machine for analyzing the equilibria of hydrates according to the method of isothermal decomposition is presented, and its operating ability is proved by measurements in the system $CuSO_4$ H_2O within the limits of the phases $CuSO_4 \times 5H_2O$/$CuSO_4 \times 3H_2O$/$CuSO_4 \times H_2O$ at 349 K. In the second part of the work a method for measuring the enthalpy of decomposition of hydrates according to the method of direct calorimetry is developed. According to the experiences gained in this work the presented method permits to determine enthalpies of decomposition with a maximum error of 2.5%.

2509 Batteries

REFER ALSO TO CITATION(S) 63244, 63249

63090 **(DE—81-023104) Recent advances in lead-acid cell research and development.** Voss, E. (Argonne National Lab., IL (USA)). 1980. 38p. (CONF-8008118—). NTIS, PC A03/MF A01.

From EVA '80 conference; Adelaide, Australia (25 Aug 1980).

During the last decade it was demonstate that the lead-acid system is capable of proving an attractive energy source of sufficient energy and power per unit weight and volume which allows its sucessful application for electric vehicle propulsion. This is shown by a number of typical examples, such as the relationship between active material properties and capacity at high rates of discharge the effect of acid stratification and others. Simultaneously, the expenditure for the maintenance of lead-acid batteries was minimized by the development of peripheric equipment, as there are means for central-automatic water refill and recombination devices. It is shown that there is still a considerable potential for further improvement which might again strengthen the unique position of the lead-acid system in the market in comparison to competitive systems.

63091 **(DOE/ER/04356—5) Electrochemical investigations of novel electrode materials. Progress report, November 1, 1981-December 31, 1982.** Worrell, W.L. (Pennsylvania Univ., Philadelphia (USA). Dept. of Materials Science and Engineering). Jun 1982. Contract AC02-77ER04356. 7p. NTIS, PC A02/MF A01. Order Number DE82021046.

Co-intercalated transition-metal disulfides in which two alkali metals are incorporated into the lattice are unique and unexplored materials. The major objective of our research program is the determination of the structural and electrochemical properties of lithium co-intercalated disulfides. The TiS_2 compounds have been extensively investigated because of their potential electrode applications in lithium batteries. Progress during the past year is discussed in four sections: preparation of lithium TiS_2 compounds, structural characterization, electrochemical-cell investigations, and external interactions. Our studies indicate that the maximum intercalated lithium content in TiS_2 can be increased by about a factor of two by the pre-intercalation of another alkali metal such as

sodium. This increase in lithium content would almost double the calculated energy density of an intercalated TiS_2 electrode in a lithium battery.

63092 **(DOE/ET/25106—T1-Vol.1) Sodium-sulfur battery development program. Progress report, November 1977-February 1979. Phase III. Final report No. 58.** Topouzian, A. (Ford Motor Co., Dearborn, MI (USA). Research Staff). 1979. Contract AC02-76ET25106. 417p. NTIS (US Sales Only). Order Number DE82019461.

Portions of document are illegible.

Progress on the design and development of sodium-sulfur batteries for electric vehicles and for load leveling is reported. Materials development, fabrication, and testing procedures and results are reported in detail. (WHK)

63093 **(NASA-CR—165508) Development of battery separator composites. Final report, Oct. 1976 - Nov. 1981.** Schmidt, G.F.; Weber, R.E. (Munising Paper Div., Neenah, WI (USA)). Nov 1981. 56p. NTIS, PC A 04/MF A01.

Improved inorganic-organic separators developed by NASA were commercially prepared. A single-ply asbestos substrate was developed, as well as alternative substrates based on cellulose and on polypropylene fibers. The single-ply asbestos was bound with butyl rubber and was functionally superior to the formerly used polyphenylene oxide saturated sheet. Commercially prepared separators exhibited better measured separator properties than the NASA standard. Cycle life in Ni/Zn and Ag/Zn cells was related to substrate, decreasing in the order asbestos cellulose paper nonwoven polypropylene. The cycle life of solvent-coated separators was better than aqueous coatings in Ni/Zn cells, while aqueous coatings were better in Ag/Zn cells.

63094 **(SAND—82-2055C) Status of flow-battery research in the United States.** Clark, R.P.; Chamberlin, J.L.; Saxton, H.J.; Symons, P.C. (Sandia National Labs., Albuquerque, NM (USA); Electrochemical Engineering Consultants, Inc., Birmingham, MI (USA)). 1982. Contract AC04-76DP00789. 26p. (CONF-820907—3). NTIS, PC A03/MF A01. Order Number DE82020963.

From 13. international power sources symposium; Brighton, UK (27 Sep 1982).

Flow batteries are defined as electrochemical energy storage devices in which at least one of the active materials is stored external to the power converting cell-stack, and in which this soluble active material is circulated via the electrolyte, through the cell-stack during system charge or discharge. Although intensive development of some of these systems has been underway for some time, they were only classified as a distinct category in the United States recently. Of the projects on flow batteries which are still being conducted, the work on the zinc/chlorine system (EDA) has been in progress since 1968; programs on zinc/bromine (Exxon, Gould), on iron/chromium Redox (NASA-Lewis Research Center), and on the iron/ferric-ferrous chloride system (NRG/GEL) have all been underway about seven years; research on the zinc/ferro-ferricyanide battery (Lockheed) has been conducted since 1978. The present paper, which reviews the 1982 status of these battery programs, appears timely since, except for the Lockheed system, the developments have all reached the stage where multi-kilowatt-hour batteries are under test.

29 ENERGY PLANNING AND POLICY

63095 **(DOE/MA—0081) DOE training evaluation guide.** (USDOE Assistant Secretary for Management and Administration, Washington, DC. Employee Development and Training Div.). Oct 1982. 41p. NTIS, PC A03/MF A01. Order Number DE83000150.

Since the inception of DOE, the Employee Development and Training Division and field training offices have sought to deliver quality training designed to meet Departmental needs as well as the career development needs of DOE employees. An essential feature of this activity is the development of an evaluation system that provides feedback to assess program effectiveness, identifies deficiencies, if any, and makes appropriate improvements or modifications. Properly used, an evaluation system can help ensure that training is dynamic and responsive to the needs of the organization (DOE). The Employee Development and Training Division, Office of Personnel, has devised this guide to be used, in whole or in part, as deemed appropriate by the responsible training office, to promote the development of effective training evaluation techniques and an ongoing training evaluation system.

2901 Energy Analysis And Modeling

63096 **(DOE/EIA/11873—T2) Requirements study concerning ADP and data communications for EIA. Report No. 2. Projected ADP requirements. Final report.** (Analytic Systems, Inc., Vienna, VA (USA); CAP Gemini, Inc., Vienna, VA (USA)). 6 Oct 1981. Contract AC01-81EI11873. 155p. NTIS, PC A08/MF A01. Order Number DE82020638.

This study updates the previous projections of FY 1982 automatic data processing needs and lists FY 1983/FY 1984 trends. Efforts focus on workload requirements, special hardware/software, and operational needs. (PSB)

2902 Economics And Sociology

REFER ALSO TO CITATION(S) 62673, 62692, 62820, 63107, 63110, 63121, 63123, 63124, 63125, 63127, 63129, 63135, 63136, 63167, 63191, 63527, 63528

63097 **(NP—2906139) VEBA business report 79.** (VEBA A.G., Duesseldorf (Germany, F.R.)). 1980. 90p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82906139.

Business report of the VEBA Ltd. of the business year 1979 including the reports of the supervisory and the executive board as well as the annual balancing of the VEBA Ltd. and the VEBA concern of 31st December 1979. Information on concerns and associated companies. Annual balancing of the VEBA Residences Ltd. 1979.

63098 **(UCRL—53283) Energy demand in the primary-metals industry: an econometric analysis.** McClernan, L.A.; Chern, W.S. (Lawrence Livermore National Lab., CA (USA)). May 1982. Contract W-7405-ENG-48. 71p. NTIS, PC A04/MF A01. Order Number DE83000025.

A generalized fuel-choice model for four fuels is formulated and is used to estimate the coefficients and three types of price elasticities for the primary metals industry. The generalized fuel-choice model differs from the multinomial logit model in that there are no a priori restrictions on the price elasticities and that third price effects are not ignored. Both the generalized fuel-choice model and a multinomial logit model are estimated for the total period (1967, 1971, 1974, 1975, 1976, 1977), the pre-embargo period (1967, 1971), and the post embargo period (1974 to 1977). Dynamic versions are also estimated with data from 1975 through 1977. The results are used to illustrate a structural change in the primary metals industry's demand for energy, forecast energy demand and fuel market shares to the year 2000, and evaluate several possible energy policies.

63099 **Issues in the use of payments in lieu of taxes to provide nuclear waste facility siting incentives.** Bjornstad, D.J. (Oak Ridge National Lab., TN (USA)); Goss, E. (Tennessee Univ., Knoxville (USA)). *Radioactive Waste Management;* **2**: No. 2, 125-142(Dec 1981).

High-level, nuclear waste isolation facilities will be federally owned and therefore exempt from local taxation. Because local residents view tax payments as a major benefit of industrial development, the absence of these payments, coupled with the inherent undesirability of hazardous-materials-handling activities, may discourage communities from accepting a facility. One method to overcome this disincentive is for the facility to make payments in lieu of taxes to localities. This paper examines the concept of payments in lieu of taxes and presents statistics describing local fiscal characteristics. The range these payments might take under alternative-payment arrangements is calculated, and the impact of such payments on the facility's user-free schedule is estimated. It is concluded that

a payment plan based on hypothetical property-tax liabilities for an identical, but taxable, facility would have a significant revenue impact on most localities but would not increase user fees significantly.

2903 Environment, Health, And Safety

REFER ALSO TO CITATION(S) 62629, 62647, 62769, 63482, 63497, 63522, 63529, 63560, 63561, 63573, 63574

63100 **(UCID—19043(Rev.1)) Project plan for construction of the Liquefied Gaseous Fuels Spill Test Facility.** O'Neal, W.C.; Hipple, D.L.; Wakeman, W.W.; Bianchini, G.M.; Blocker, R.E.; Ochoa, M. (Lawrence Livermore National Lab., CA (USA)). 16 Dec 1981. Contract W-7405-ENG-48. 81p. NTIS, PC A05/MF A01. Order Number DE82009303.

Portions of document are illegible.

The purpose of this project is to design and construct a safe and reliable 500-m^3-capacity facility for storing and spill-testing liquefied gaseous fuels (LGFs) at Frenchman Flat, in the Nevada Test Site. The facility will be used to experimentally verify computer models for predicting LGF spill effects. It will be initially designed for liquefied natural gas (LNG), but it will also be capable of testing LPG, LNH_3, and LH_2 with some modifications. This project plan describes the design and construction of the facility, environmental considerations, site selection, cost and schedule, and the organization and management arrangement for carrying out the project.

63101 **Life sciences research in synthetic fuels at Oak Ridge National Laboratory.** Cowser, K.E. (ORNL, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **39**: 6-8(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

2904 Natural Resources

REFER ALSO TO CITATION(S) 62811, 62812, 62813, 62814, 62815, 62816, 62817

63102 **(DOE/SF/01484—T5) Survey of literature relating to energy development in Utah's Colorado Plateau.** Larsen, A. (Brigham Young Univ., Provo, UT (USA)). Jun 1980. Contract AM03-77SF01484. 738p. D. Order Number DE82008981.

This study examines various energy resources in Utah including oil impregnated rocks (oil shale and oil sand deposits), geothermal, coal, uranium, oil and natural gas in terms of the following dimensions: resource potential and location; resource technology, development and production status; resource development requirements; potential environmental and socio-economic impacts; and transportation tradeoffs. The advantages of minemouth power plants in comparison to combined cycle or hybrid power plants are also examined. Annotative bibliographies of the energy resources are presented in the appendices. Specific topics summarized in these annotative bibliographies include: economics, environmental impacts, water requirements, production technology, and siting requirements.

63103 **(GAO/EMD—82-29) Mineral data in the Forest Service's Roadless Area Review and Evaluation (RARE II) is misleading and should be corrected.** (General Accounting Office, Washington, DC (USA). Office of the Comptroller General). 4 Feb 1982. 25p. General Accounting Office, PO Box 6015, Gaithersburg, MD 20760.

Portions of document are illegible.

GAO found that the mineral data in the RARE II report contains several inaccuracies that may be misleading: (1) areas were rated as having little or no mineral potential when they should have been rated as having unknown potential; (2) indications of mineral potential were inconsistently applied from one area to another; and (3) mineral data for certain confined geographic areas was projected into larger areas. GAO wants the Congress to be aware of the inaccuracies and limitations of the RARE II report when considering wilderness legislation and recommends that the Department of Agriculture provide the Congress with corrected data.

2905 Research, Development, Demonstration, And Commercialization

REFER ALSO TO CITATION(S) 62591, 62896, 63055, 63096, 63106, 63137

63104 **(EDF-R—81DD02007) Thermal power generation - progress report, 1980.** (Electricite de France, 93 - Saint-Denis. Direction de la Production et du Transport). Feb 1981. 100p. (In French). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82702682.

The year 1980, in continuation of the previous year, was marked by the completion of three essential objectives: 1) the successful commissioning of the new PWR units and the satisfactory operation of the 900 MW units in service, 2) the optimum burning of coal, 3) keeping up the maintenance efforts on the conventional thermal complex. The realisation of these objectives led the Department to continue its drive to recruit, train and integrate new staff.

63105 **(NP—2903876) 1979-1980 annual report of the Juelich Nuclear Research Institute.** (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.)). 1980. 149p. (In German). Kernforschungsanlage Juelich GmbH, Postfach 1913,517 Juelich, Germany.

Information is given on Institute-sponsored, co-sponsored (with other scientific and/or educational institutions) and studies conducted at the Institute in the areas of theoretical and practical energy models, new raw materials for the production of cast-molds, management of radioactive waste from industrial research and medical research, polarized electrons, environmental sampling, high-temperature reactors, nuclear fusion, environmental and health research, material studies, research planning and development.

2906 Nuclear Energy

REFER ALSO TO CITATION(S) 62741, 62761, 62782, 63012, 63056, 63099, 63104, 63133

63106 **(NP—2903423) 1978 annual report of the Argentine Federal Atomic Energy Commission, Buenos Aires.** (Comision Nacional de Energia Atomica, Buenos Aires (Argentina)). 1978. 36p. (In Spanish). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82903423.

Portions of document are illegible.

Information is given on the development of nuclear energy, production and exploration of uranium, production of mineral concentration, radiation and radio isotope applications, nuclear technology, nuclear physics research and development, radiation protection and nuclear safety, administration and financing. 1 figure, 2 tables.

63107 **Worldwide nuclear power.** Royen, J. (Dept. of Energy, Washington, DC). *Worldwide Nuclear Power;* 90(Aug 1981).

Worldwide nuclear power (WNP) is a companion volume to UPDATE. Our objective in the publication of WNP is to provide factual information on nuclear power programs and policies in foreign countries to U.S. policymakers in the Federal Government who are instrumental in defining the direction of nuclear power in the U.S. WNP is prepared by the Office of the Assistant Secretary for Nuclear Energy from reports obtained from foreign Embassies in Washington, U.S. Embassies overseas, foreign and domestic publications, participation in international studies, and personal communications. Domestic nuclear data is included only where its presence is needed to provide easy and immediate comparisons with foreign data.

63108 **(BLG—551) Annual scientific report 1980.** Billiau, R.; Proost, J. (eds.). (Facultes Universitaires Notre-Dame de la Paix, Namur (Belgium)). [nd]. 35p. NTIS (US Sales Only), PC A02/MF A03. Order Number DE82702680.

This report of the Centre d'Etude de l'Energie Nucleaire - Studiecentrum voor Kernenergie - gives a survey of the scientific and technical work done in 1980. The research areas are: 1. The sodium cooled fast reactor and namely the mixed oxide fuels, the carbide fuel, the materials development, the reprocessing, the fast reactor physics; the safety and instrumentation and the sodium technology. 2. The gas cooled reactors as gas cooled fast and high temperature reactors. 3. The light water reactors, namely the BR3 reactor, the light water reactor fuels and the plutonium recycling. 4. The applied nuclear research, waste conditioning and disposal as the safeguards, the fusion research and the lithium technology. 5. The basis and exploratory research namely the materials science and the nuclear physics and finally 6. Non-nuclear research and development such as the air pollution, the pollution abatement and waste handling, the fuel cells and applied electrochemistry.

2908 Waste Heat Utilization

REFER ALSO TO CITATION(S) 63189, 63207

63109 **Cogeneration energy systems show promising market potential in residential and commercial sector over next twenty-five years.** Teotia, A.P.S.; Davis, A.A.; Poyer, D. (Argonne National Lab., Ill). *Proceedings, Intersociety Energy Conversion Engineering Conference;* **1**: 528-533(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

Under its energy-conservation programs, the U.S. Department of Energy has been actively involved in the research and development of cogeneration systems to meet energy demands in the residential and commercial sectors. The market potential of various cogeneration systems was estimated by using an econometric and probabilistic methodology. Research has shown that the cogeneration systems residential/commercial market penetration could result in annual scarce-fuel savings of 1.5 to 1.9 quads by the year 2004. 6 refs.

2910 Conservation

REFER ALSO TO CITATION(S) 63122, 63128, 63163, 63164, 63168, 63182

63110 **Annual review of energy, volume 6, 1981.** Hollander, J.M.; Simmons, M.K.; Wood, D.O. (eds.). Palo Alto, CA; Annual Reviews, Inc., (1981). 551p.

This volume is a collection of 17 papers on the state of development of economically viable substitutes for oil and on methods of achieving or enhancing energy conservation. Topics discussed include an update of solar energy technology, the implications of the Three Mile Island accident, the potential of biomass energy from agriculture, probabilistic risk analysis of energy technologies, wood energy in the United States, a program for decreasing U.S vulnerability during an oil crisis, energy conservation in new buildings, factors in U.S. synthetic fuels development, the role of OPEC policies in world oil availability, the role of local governments in promoting energy efficiency, energy implications of fixed-rail mass transit, the social impacts of soft and hard energy systems, energy consumption by industry, an economic comparison of different types of power plants in the Chicago area, the dissemination of energy information, and the role of petroleum price and allocation regulations in managing energy shortages. A separate abstract was prepared for each of 15 papers.

63111 **(CONF-801288—Summ.) EnergieTec '80 - Energy research for practical purposes.** (Institut fuer Zukunftsforschung G.m.b.H. (IFZ), Berlin (Germany, F.R.)). [nd]. 10p. (In German). T. Order Number DE82902384.

From International congress on energy research for practical purposes; Berlin, F.R. Germany (8 Dec 1980).

Collected energy-saving ideas for multiple dwellings was the main topic of discussion at the 'Energie Tec 80 - Energy research for practical purposes' conference, which the Berlin Senator for Science and Research, the IFZ Berlin (Institute for Futurology), and the AMK Berlin (Economic Fair Exhibition Congress) organized in the International Congress Centre of Berlin from 8-9 December 1980. At this conference, which is going to take place every two years, for the first time an up-to-date survey of practical experiences with both passive and active ways of saving energy were discussed.

2920 Supply, Demand, And Forecasting

REFER ALSO TO CITATION(S) 63117, 63129

63112 (AECL—7429, pp 1-47) **Canadian heavy water production - 1970 to 1980.** Galley, M.R. (Atomic Energy of Canada Ltd., Ottawa, Ontario. Heavy Water Projects). Oct 1981. NTIS (US Sales Only), PC A06/MF A01.

From 2. world congress of chemical engineering; Montreal, Canada (4 Oct 1981).

In the last decade, heavy water production in Canada has progressed from the commissioning of a single unit plant in Nova Scotia to a major production industry employing 2200 persons and operating three plants with an aggregate annual production capability in excess of 1800 Mg. The decade opened with an impending crisis in the supply of heavy water due to failure of the first Glace Bay Heavy Water Plant and difficulty in commissioning the second Canadian plant at Port Hawkesbury. Lessons learned at this latter plant were applied to the Bruce plant where the first two units were under construction. When the Bruce units were commissioned in 1973 the rate of approach to design production rates was much improved, renewing confidence in Canada's ability to succeed in large scale heavy water production. In the early 1970's a decision was made to rehabilitate the Glace Bay plant using a novel flowsheet and this rebuilt plant commenced production in 1976. The middle of the decade was marked by two main events: changes in ownership of the operating plants and initiation of a massive construction program to support the forecast of a rapidly expanding CANDU power station construction program. New production units embodying the best features of their predecessors were committed at Bruce by Ontario Hydro and at La Prade, Quebec, by AECL. The high growth rate in electrical demand did not continue and some new plant construction was curtailed. The present installed production capacity will now probably be adequate to meet anticipated demand for the next decade. Canadian plants have now produced more than 7800 Mg of heavy water at a commercially acceptable cost and with a high degree of safety and compliance with appropriate environmental regulations.

63113 (AECL—7429, pp 49-100) **Heavy water production benefits of a supporting r and d program.** Bancroft, A.R.; Chuang, K.T.; Dalrymple, D.G. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). Oct 1981. NTIS (US Sales Only), PC A06/MF A01.

From 2. world congress of chemical engineering; Montreal, Canada (4 Oct 1981).

Considerable economic benefit was obtained from an active R and D program while the Canadian heavy water plants were brought to mature operation during the 1970s. The introduction to Canada of this new chemical processing industry led to unexpected process, equipment and materials problems. Having a small team of technical experts already working on heavy water processes and a much larger R and D team working in related fields allowed a rapid response to the problems that limited production. The number of engineers and scientists working on the GS process rose rapidly from a skeleton team in 1970 to 54 during 1974. Effort declined steadily as the major problems were solved and reached 22 by 1980. Cumulative effort over the decade was 264 man-years at a cost of 3.3 percent of the value of the heavy water produced. The new production benefits have lagged behind the R and D expenditure by a few years and the current spending rate is 1.2 percent of product value. Important contributions were made in the areas of process simulation, process chemistry, materials of construction, sieve trays, and mechanical equipment.

63114 (DOE/PE—0029/1) **Energy projections to the Year 2000: July 1982 update.** (USDOE Office of Policy, Planning and Analysis, Washington, DC. Analytical Services Div.). Aug 1982. 134p. NTIS, PC A07/MF A01. Order Number DE82022523.

Portions of document are illegible.

This report is an update of the energy projections and analysis presented in a document entitled Energy Projections to the Year 2000, a technical supplement to the National Energy Policy Plan (NEPP) submitted to Congress in July 1981. The format focuses on self-explanatory tables and figures with a minimum of accompanying text.

63115 **U.S. energy demand and supply scenarios: a retrospective appraisal of the U.S. National Academy of Sciences study by the Committee on Nuclear and Alternative Energy Systems (CONAES).** Hollander, J.M. (Univ of Calif, Berkeley). *Energy (Oxford);* 6: No. 8, 699-725(Aug 1981). (CONF-800296—).

From 3. workshop of the Asia-Pac Energy Study Consultant Group; Honolulu, HI, USA (25 Feb 1980).

The anticipated energy demand of the CONAES study (EAPA 6:4038) is based on the assumption that the gross national product during this period (1975-2010) will grow at an average rate of either 2 or 3% and that the cost of energy will either remain constant, double or quadruple. The combination of these factors provides eight different scenarios for energy demand. The estimate of energy supply from various sources is worked out as a function of sociopolitical conditions which may either remain substantially unchanged, enhance energy supply by appropriate political action, or else will drive the growth of energy supply to the limit. These assumptions were the starting point for preparing three scenarios for the energy supply, each with a different mix of energy derived from various sources. One conclusion arrived at is that, depending on the policies implemented, vastly different figures (with variations up to 2:1) can be forecasted for energy requirements in the year 2010, without significantly affecting either the standard of living or the lifestyle of Americans. 17 refs.

2930 Policy, Legislation, And Regulation

REFER ALSO TO CITATION(S) 63112, 63113, 63126, 63136, 63192, 63193, 63194, 63197, 63199, 63200, 63201

63116 (CONF-790280—, pp 13-19) **Regulatory process under the National Energy Act.** Holden, M. Jr. (US Dept. of Energy, Washington, DC). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

Information is presented on the regulatory mechanism as it now exists at least as far as FERC is concerned; the rationale, of the National Energy Act; some major considerations in the electric portion of the National Energy Act, principally reflected in the Public Utility Regulatory Policies Act (PURPA); some major considerations in the Natural Gas Policy Act; and on the ever present, ever the same and ever changing, nature of the government-market relationship.

63117 (CONF-790280—, pp 20-35) **Perspectives on energy activities after NEA.** Bauer, D.C. (American Electric Power Service Corp., New York, NY). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

US energy requirements to the year 2000 are forecast and the effects of the National Energy Plan and of DOE policies and programs on meeting these requirements are discussed. The organization, personnel and programs of DOE are reviewed and the effects of the national economy and the political climate during an election year on DOE functions are considered. (LCL)

63118 (CONF-790280—, pp 73-87) **Structural economic consequences of a regulatory vs market future for the energy/materials sector.** Thompson, R.G. (Univ. of Houston, TX). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

After reviewing new trends in energy production, imports and requirements in the US, the effects of the National Energy Act (NEA) on energy supplies, energy conservation, development of existing and alternative energy sources, and the growth of the national economy, and the implications of the NEA with respect to the costs and benefits of regulations are discussed. Several recommendations are made for additional policy considerations relative to crude oil pricing, environmental constraints, deregulation of electric utilities, and fuel use taxes. (LCL)

63119 (NP—2018198) **Save it, Florida: annual report to the Legislature 1981.** (Florida Governor's Energy Office, Tallahassee (USA)). Nov 1981. 60p. Governor's Energy Office, 301 Farris Bryant Building, 620 S. Meridian St., Tallahassee, FL 32304.

Including a report on electric and natural gas utility energy activities by the Florida Public Service Commission.

The following aspects of Florida's energy program are reported: Florida's energy situation-1981, organization and funding, responsibilities and accomplishments, and recommendation. The report of the Public Service Commission is included.

63120 (RAND/N—1876-DOE) **Analysis of the Department of Energy's nonprice regulation of industrial energy use.** Johnson, L.L.; Seidman, D. (RAND Corp., Santa Monica, CA (USA)). May 1982. Contract AC01-80PE70269. 92p. NTIS, PC A05/MF A01. Order Number DE82021642.

This study analyzes Department of Energy regulatory activities within the industrial sector, focusing on nonprice regulations such as prohibitions on specific fuel use. Basic analytic inputs into DOE's decisions about their future regulatory activities are examined.

2940 Fossil Fuels

REFER ALSO TO CITATION(S) 62641, 62647, 62673, 62673, 62686, 62690, 62692, 62693, 63100, 63116, 63120, 63191

63121 (CONF-790280—, pp 36-48) **De-throning the philosopher kings.** Foster, D.H. (Natural Gas Supply Association, Washington, DC); Erickson, E.W. 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

This paper is divided into 2 parts: the first deals with the history of the Natural Gas Policy Act (NGPA) of 1978 and some general thoughts on the origin of governmental policies; the second deals with the impact on residential consumers of various performance assumptions under the NGPA.

63122 (CONF-790280—, pp 55-72) **Potential for natural gas conservation.** Lawrence, L.R. Jr. (Gas Research Inst., Chicago, IL). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

Energy conservation through mandated energy efficiencies and straightforward cutbacks in usage by the public and private sectors can clearly generate important natural gas savings. However, the really significant national gains can be realized only through the timely development and implementation of a range of advanced technology concepts that promise very high efficiencies. The federal government pursues R & D of some of these concepts, but that effort to date has been rather modest. Specifically, in FY-1978, DOE's energy R & D budget amounted to $2.7 billion. The gas in-

dustry and the private sector also pursue a limited amount of advanced technology R & D, spending a total of $21 million in 1978. What is needed is a national, ongoing, success oriented effort on the part of DOE, GRI, and private industry to accelerate the development and commercialization of more efficient gas-using equipment and processes. Five major areas in which success structured R & D programs would lead to major national benefits are: residential and commercial space conditioning, gas appliances, industrial processes and equipment, fuel cell systems, and solar augmentation systems. But development of more efficient advanced technologies and realization of these important gas savings require a clearly defined and understood strategy. Experience in success oriented aerospace programs has shown clearly how programs must be structured if objectives are to be achieved. In brief, that strategy is based on a level of funding, in a given technical area, that will support a broad technology base, with competing hardware efforts designed to develop or to improve and commercialize specific technologies, processes, or devices.

63123 (CONF-790280—, pp 253-259) **Natural gas, the NEA, and Texas.** Clammer, S.R. (Lone Star Gas Co., Dallas, TX). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

The Lone Star Gas Company experienced significant sales declines due to increases in gas prices. Increased gas prices have improved the availability of gas, and caused commercial and residential customers to conserve. Some customers have switched to alternate energy sources. Significant conservation has resulted from higher gas prices, even though the full costs are not paid by customers. PURPA, Title III- Retail Policies for Natural Gas Utilities, has three stated goals: encourage conservation of gas utility supplied energy; encourage optimal use of facilities and resources by gas utility systems; encourage equitable rates for natural gas customers. The author believes that the National Energy Act (NEA) in its entirety only aims at the first goal. (ATT)

63124 (CONF-790280—, pp 260-263) **Basic principles of rate design: how firm the foundation.** Hammond, L.H. (North Carolina Utilities, Raleigh). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

There are six basic rate design objectives: (1) assure that resources are allocated in an economically efficient manner; (2) assure that prices are applied in nondiscriminatory fashion; (3) assure that revenue requirements are met; (4) encourage conservation; (5) generate a relatively stable revenue stream; (6) maintain continuity with past rate-making practices. Historical rate structures are discussed. Here the rationale for the traditional declining block rate is given. The author identifies the current concerns of debate on natural gas policy. The tradeoff between the allocative function of price in determining the best use of a resource and income and resource distributional equity is highlighted. (ATT)

63125 (CONF-790280—, pp 264-271) **Natural Gas Policy Act of 1978 - incremental pricing, and rate design (from the distribution company's point of view).** Miller, W.E. (Baltimore Gas and Electric Co., MD). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

Some of the pricing provisions of the National Gas Policy Act and their potential impact on natural gas distribution companies are discussed following an historical update on Baltimore Gas and Electric Company (BG & E). Despite the gradual decline of historic gas supplies, and the high cost of substitute fuels, the author believes the future of the gas business is good. Additional break-throughs will develop in on-shore and off-shore exploration efforts; and in the long run, a combination of concerted research and development among the various segments of the industry coupled with cooperation of federal and local regulations, will result in continuing horizons. The author hopes that those who are responsible for the service tariffs which must provide for revenue and earnings stability will strive to devise new approaches to rate design. These should, hopefully, achieve the optimum in: (1) conservation of energy by customers; (2) efficient use of facilities and resources by utility systems; and (3) equity in rates to customers. Changes that would naturally follow new developments can be made in stride over time rather than by compulsive, drastic changes that may do more harm than good, not only to the utilities but to customers.

63126 (CONF-790280—, pp 284-289) **Incremental pricing under Title II of the Natural Gas Policy Act of 1978.** Pedersen, N.A. (Federal Energy Regulatory Commission, Washington, DC). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

Two special features of Title II of the Natural Gas Policy Act are examined. The first is an exemption from incremental pricing for five types of industrial facilities: (1) small industrial boiler fuel facilities which use less than 300 Mcf per day; (2) cogenerators; (3) generation of electricity by electric utilities; (4) schools, hospitals and similar institutions; (5) agriculture uses. The second feature is the ceiling on incremental pricing which is considered in detail. The ceiling prevents the price of natural gas from efficiently allocating gas, and conserving energy. The article examines the two-pronged effort which is underway to implement incremental pricing. The first prong is to develop a mechanism for passing through incremental costs. The second prong is to prescribe a method for determining the alternative fuel cost ceiling on incremental pricing. Questions which each of these prongs raised are considered. (ATT)

63127 (NP—2905796) **RAG - Ruhrkohle Aktiengesellschaft: Business report 1980.** (Ruhrkohle A.G., Essen (Germany, F.R.)). 1981. 98p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82905796.

Business report of the Ruhrkohle Ltd. on the business year 1980 including the reports of both super sory and executive board as well as the annual balances of the Ruhrkohle Ltd. and the concern of 31. December 1980 with explanations and a list of the concerns and associated companies.

63128 (CONF-8111117—1-Trans.) **Gaseous fuels within the compass of energy policy and economy.** Silvestri, M. (British Gas Corp., London). 1981. Translation source information not available . 15p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82906407.

From 6. convention of the technological section - individual gas heating: means for saving energy; Rome, Italy (5 Nov 1981).

Portions of document are illegible.

The origin of natural gas deposits is briefly described. At the present consumption rate, supplies of natural gas should last another 51 years; estimated production rates are tabulated. Italy is on her way to increasing her energy requirements covered by natural gas to 20% by 1990. The advantages of changing over to natural gas are summarized. The use of methane as an autonomous heating fuel as opposed to other solutions such as remote heating - often combined with co-generation - is addressed.

2950 Hydrogen And Synthetic Fuels

REFER ALSO TO CITATION(S) 62802, 62803, 63101, 63110

2960 Electric Power

REFER ALSO TO CITATION(S) 62811, 62812, 62813, 62814, 62815, 62816, 62817, 62992, 62998, 63116, 63188, 63191, 63195, 63196, 63197, 63198, 63199,

63201

63129 (CONF-820260—1) Electricity: the lowest-cost and highest-productivity form of energy. Felix, F. (Gibbs and Hill, Inc., New York (USA)). 1982. 31p. Atomic Industrial Forum, Inc., Publications Department, 7101 Wisconsin Avenue, Washington, DC 20014.

From Atomic Industrial Forum workshop on nuclear power financing; Las Vegas, NV, USA (7 Feb 1982).

The advantages of electricity are that it is the lowest cost form of energy, achieves greatest conservation gains, and is the highest productivity form of energy, and its use is the key to manufacturing productivity, holds down the use of oil and gas, fights inflation, stimulates creativity and progress, and creates more jobs. The links between the growth of electric power generation and use, of total energy, and of the GNP in countries throughout the world are discussed. Finally, the low record of US economic growth and of electricity growth, the future of the US electric utility industry, and the necessity for increased electric power generation in order to propel the US toward economic recovery and greater energy independence are described. (LCL)

63130 (DOE/PE—0044) Close look at eight great energy myths with particular attention to the generation and use of electricity. (USDOE Office of Policy, Planning and Analysis, Washington, DC). May 1982. 41p. NTIS, PC A03/MF A01. Order Number DE82021118.

This paper is to assess implications for the generation and use of electricity. Projections are compared with others prepared by the Energy Information Administration, DOE's Office of Policy, Planning and Analysis, and Energy and Environmental Analysis, Inc. Major differences in method, inputs, and results are identified, and to the extent possible, explained. Section II is a general summary of the review, and presents principal assumptions, methods, results, and major conclusions. Sections III, IV and V provide more detail to trace the analysis more closely. Section III, for example discusses some fundamental criticisms of the conceptual approach. Section IV, in contrast, accepts the basic framework but raises certain criticisms of the analysis within that framework. Section V discusses the treatment of electric generation in this paper, and probes the implications of the results.

63131 (DOE/RG/10367—T12) Final technical report for the information dissemination system of the Department of Energy's Economic Regulatory Administration. (Systems and Applied Sciences Corp., Riverdale, MD (USA)). 1982. Contract AC01-80RG10367. 64p. NTIS, PC A04/MF A01. Order Number DE83000583.

Portions of document are illegible.

The Department of Energy's (DOE), Economic Regulatory Administration (ERA) had a requirement to report to Congress on determinations made by State regulatory authorities and nonregulated utilities regarding their purposes of Title I and III of the Public Utility Regulatory Policies Act (PURPA) of 1978. The purposes stated in PURPA were to promote conservation of energy supplied by utilities, efficiency in the use of utilities, and equitable rates for utility consumers. ERA was required to assist State regulatory authorities and nonregulated utilities in carrying out their PURPA responsibilities by implementing information dissemination activities. The technical and administrative support for implementing ERA's information data base to their user audience is discussed.

63132 (DOE/RG/10367—T13) State regulatory authorities and nonregulated utilities: purposes of Title I and III of the Public Utility Regulatory Policies Act (PURPA) of 1978. Quarterly project status report, July-September 1982. (Systems and Applied Sciences Corp., Riverdale, MD (USA)). Sep 1982. Contract AC01-80RG10367. 15p. NTIS, PC A02/MF A01. Order Number DE83000582.

The Department of Energy's (DOE) Economic Regulation Administration (ERA) had a requirement to report to Congress on determinations made by State regulatory authorities and nonregulated utilities regarding their purposes of Title I and III of the Public Utility Regulatory Policies Act, (PURPA) of 1978. The purposes stated in PURPA are to promote conservation of energy supplied by utilities, efficiency in use of utilities, and equitable rates for utility consumers. In addition, ERA is required to assist State regulatory authorities and nonregulated utilities in carrying out their PURPA responsibilities by implementing information dissemination activities. The technical and administrative support for implementing ERA's information data base to their clientele is discussed. The following segments are discussed as they relate to ERA's information dissemination system: information acquisition dissemination; information analysis and retrieval; information storage; and information maintenance.

63133 (DOE/RL/02227—T15-1) Summer workshop on electric power generation: comparative costs and benefits. Final report. (Oregon State Univ., Corvallis (USA)). Aug 1972. Contract AM06-76RL02227. 38p. (RLO—2227/T15-1). NTIS, PC A03/MF A01. Order Number DE82022529.

Portions of document are illegible.

The design and implementation of a workshop intended to equip secondary school teachers with adequate information so that they will be able to make reasonable assessments on issues relevant to power generation, particularly nuclear power generation, and be able to transmit factual information to their students are described and the effectiveness of the workshop is evaluated. (LCL)

63134 (EPRI-EA—2471) Approaches to load forecasting: proceedings of the third EPRI load-forecasting symposium. Crow, R.T. (ed.). (Applied Forecasting and Analysis, Inc., Los Altos, CA (USA)). Jul 1982. 395p. (CONF-8103141—). NTIS, PC A17/MF A01. Order Number DE82905839.

From 3. EPRI symposium on approaches to load forecasting; Kansas City, MO, USA (25 Mar 1981).

Portions of document are illegible.

The papers included in this volume were presented at the Third EPRI Symposium on Electric Utility Load Forecasting held in Kansas City, Missouri in March 1981. The symposium was organized to provide electric utility forecasters an opportunity to learn the current state of the art from colleagues in the industry. Proceedings of the first two symposia have been published by EPRI (EPRI EA-1035-SR and EPRI EA-1729-SR). The emphasis of all of the symposia has been on practice and application. In the Third Symposium, sessions were devoted to data problems, EPRI's efforts to enhance the flow of information on forecasting, forecasting sales, hourly load forecasting, and other topics. Nineteen papers were submitted for publication in the proceedings.

63135 (P—300-82-008) Integrated supply and demand report on electricity. Volume II: appendices. (California Energy Resources Conservation and Development Commission, Sacramento (USA)). 2 Jul 1982. 258p. California Energy Commission, 1111 Howe Avenue, Sacramento, CA 95825.

Portions of document are illegible.

The following appendixed information to the report of the California Energy Commission on electric power demand and generation forecasts to 1994 is presented: the financial condition of utilities; analysis of utility costs; summary of utility resource plans; demand forecasts by service area; and method used for computing reserve margins. (LCL)

2990 Unconventional Sources And Power Generation

REFER ALSO TO CITATION(S) 62820, 62823, 62834, 62854, 62865, 62892, 62896, 62909

63136 (UCRL—15446(Vol.1)) Cost of Federal tax credit programs to develop the market for industrial solar and wind energy technologies. Final report to Lawrence Livermore Laboratory, University of California. Volume 1. Downey, W.T.; Carey, H.; Dlott, E.; Frantzis, L.; McDonald, M.; Myer, L.; O'Neill, K.; Patel, R.; Perkins, R. (Little (Arthur D.), Inc., Cambridge, MA (USA)). 12 Nov 1981. Contract W-7405-ENG-48. 138p. NTIS, PC A07/MF A01. Order Number DE82009061.

Portions of document are illegible.

In 1978, Congress passed the Energy Tax Act which, in addition to the 10% investment tax credit then available, added a

10% tax credit (increased to 15% by the Crude Oil Windfall Profits Tax Act of 1980) to specifically encourage industrial investment in equipment which either generated energy from renewable sources or conserved energy. The purpose of this study is to estimate the amount of renewable energy investment these tax credits will cause, if they are retained until 1991, and to estimate the net costs to the US Treasury of providing these tax credit programs. The effect of increasing the level of renewable energy tax credit program from 15 to 30, 45, or 60% was also considered. In addition, the current tax credit program and the at-risk provision of tax law were examined and their impact on renewable energy investment considered. The present situation, the anticipated effects of preserving the present tax credit policy, and the probable effects of changing tax credit policy to further encourage renewable energy investment are examined. The findings on each of these issues are summarized.

63137 **Overview of the Department of Energy biomass program.** Farrow, R.E. (US DOE, Washington, DC). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 1: 487-489(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

The Department of Energy support of a biomass energy research and development program under the direction of the Biomass Energy Systems Division (BES) is reviewed. Biomass, a renewable and domestic source of fuels and chemical feedstocks, has the greatest potential for displacing oil and natural gas in the near-term of all the solar technologies. 1 ref.

30 DIRECT ENERGY CONVERSION

3001 Mhd Generators

REFER ALSO TO CITATION(S) 62642

63138 **(DOE/ET/11417—T5) MHD high-performance demonstration experiment. Quarterly progress report, January 1, 1982-March 31, 1982.** (Arnold Engineering Development Center, Arnold Air Force Station, TN (USA)). May 1982. Contract AI01-78ET11417. 34p. NTIS, PC A03/MF A01. Order Number DE82021555.

A combustor and magnet test was conducted during this reporting period. However, technical difficulties prevented a 4 T power production test. Diagonal operation and the possibility of changing the channel loft are presently being investigated. The magnet is being repaired and a 4 T power production test is anticipated during the next quarter.

63139 **Results from conceptual design study of potential early commercial MHD/steam power plants.** Hals, F.; Kessler, R.; Westra, L.; Zar, J.; Morgan, W.; Bozzuto, C. (Avco Everett Res Lab Inc, Mass). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 2: 1493-1498(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

This paper presents information developed in two phases of a joint study of Potential Early Commercial MHD Power Plants. The main objective of this study is to develop information on such plants in order to identify attractive entry level plant designs requiring less development than more mature MHD power plants defined by previous studies. 6 refs.

63140 **MHD channel performance for potential early commercial MHD power plants.** Swallom, D.W. (Avco Everett Res Lab Inc, Mass). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 2: 1499-1505(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

The MHD channel analysis for the conceptual design study of potential early commercial (CSPEC) MHD power plants is demonstrated to have reasonable performance obtained for full load and part load operation. Some limited parametric analysis as well as the specific point designs were performed. 15 refs.

63141 **Conceptual design of the MHD Engineering Test Facility.** Bercaw, R.W.; Rigo, H.S.; Warinner, D.K.; Giza, D.A. (NASA, Lewis Res Cent, Cleveland, Ohio). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 2: 1512-1517(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

This paper summarizes the reference conceptual design of the MHD Engineering Test Facility (ETF), a prototype 200 MWe coal-fired electric generating plant designed to demonstrate the commercial feasibility of open cycle MHD. Main elements of the design are identified and explained, and the rationale behind them is reviewed. 12 refs.

63142 **Retrofit of a coal-fired open-cycle liquid-metal MHD to steam power plants.** Pierson, E.S.; Herman, H.; Petrick, M.; Grammel, S.J.; Dubey, G. (Argonne Natl Lab, Ill). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 2: 1525-1530(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

The application of the new, coal-fired open-cycle liquid-metal MHD (OC-LMMHD) energy-conversion system to the retrofit of an existing, oil- or gas-fired conventional steam power plant is evaluated. The criteria used to evaluate the retrofit are the net plant efficiency and the cost benefit relative to other options. 7 refs.

63143 **Aspects of open-cycle MHD affecting heat and seed recovery.** Berry, G.F. (Argonne Natl Lab, Ill). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 2: 1531-1538(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

This paper explores aspects of an MHD power plant operation that influence the design of heat and seed recovery equipment. Particular emphasis is directed toward aspects which are unique to open-cycle MHD operations, as envisioned by the ANL/MHD System Analysis Group. 25 refs.

63144 **Heat recovery/seed recovery system development.** Probert, P.B. (Babcock and Wilcox Co, Barberton, Ohio). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 2: 1539-1543(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

Under U.S. Department of Energy (DOE) contract BandW has been designing and developing the technology base for the design of the ETF, the commercial demonstration MHD electric power plant. The portions of the technology that are similar to commercial units includes water- and steam-side heat transfer, mechanical arrangement and stress analysis, fabrication and assembly methods, welding, heat treating, nondestructive testing, and others. 3 refs.

63145 **Chemical kinetic modeling on homogeneous NO/sub x/ production and removal in MHD systems.** Stewart, G.W.; Wormhoudt, J.C.; Yousefian, V.; Silver, J.A.; Kolb, C.E. (Aerodyne Res Inc, Bedford, Mass). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 2: 1544-1549(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

A chemical kinetic modeling investigation of several alternative methods of NO control in MHD generator combustion gas streams is presented. Example calculations consider a typical MHD channel and diffuser coupled to either large, insulated radiant boiler with increased residence time and low heat loss or a conventional radiant boiler. The discussion of ammonia addition is based on an improved chemical rate package, and includes examples of the sensitivity of predicted NO concentrations to remaining uncertainties in rate constants. 37 refs.

63146 **Investigation of powerplants using disk MHD generators.** Retallick, F.D. (Westinghouse Electr Corp). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 2: 1506-1511(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

A summary of the systems results from a study of power plants using MHD generators of the disk geometry is presented. Open and closed cycle systems were investigated, both of which

were coal fired. Powerplant performance, plant design and costing of the nozzle, channel, diffuser, radiant boiler, magnet and power management system were performed for the open cycle system. 3 refs.

3003 Thermoelectric Generators

REFER ALSO TO CITATION(S) 63055

63147 **Long-term behavior of silicon germanium thermoelectric generators.** Shields, V. (JPL, Pasadena, Calif). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 1: 315-320(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

Problems regarding the use of silicon germanium technology for Multi-Hundred Watt (MHW) Radioisotope Thermoelectric Generators (RTG) have been investigated at JPL. The practicability of storage and the subsequent handling of silicon germanium thermoelectric materials for future use has been addressed. 4 refs.

63148 **Procedure for calculating thermoelectric heat exchanger performance.** Bohn, M.S. (Sol Energy Res Inst, Golden, Colo). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 2: 2008-2012(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

This paper presents a method for calculating the electrical power generated by a thermoelectric heat exchanger. The thermoelectric heat exchanger transfers heat from a hot fluid to a cold fluid through a thermoelectric generator located in the heat-exchanger wall separating the two fluid streams. The method presented here is an extension of the NTU method used to calculate heat exchanger heat transfer effectiveness. 4 refs.

63149 **Some thermoelectric properties of the light rare earth sesquiselenides (R/sub 2/Se/sub 3-x/).** Takeshita, T.; Beaudry, B.J.; Gschneidner, K.A. Jr. (Iowa State Univ, Ames). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 2: 1993-1996(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

Rare earth sesquiselenides of the Th/sub 3/P/sub 4/ structure show variable electric properties over their homogenity range. The rare earth sesquiselenides are also refractory materials and therefore are of interest for high temperature thermoelectric applications. Preliminary results of thermoelectric power and electrical resistivity measurements on the light lanthanide sesquiselenides (La through Sm) are presented. 9 refs.

63150 **Bi-Sb thin films for thermoelectric energy conversion.** Trefny, J.U. (Colo Sch of Mines, Golden). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 2: 2019-2021(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

The feasibility of large-scale thermoelectric energy conversion and overcoming formidable economic barriers is discussed. Innovative system designs, the development of new improved semiconductor materials and/or the development of low-cost processes for fabricating thermoelectric generators is described. This paper will discuss the use of vacuum-deposited thin films of Bi-Sb to meet the third of the above requirements. 2 refs.

3004 Thermionic Converters

63151 **Design of series-parallel connected thermionic converter arrays.** Mcvey, J.B.; Britt, E.J.; Fitzpatrick, G.O.; Dick, R.S. (Rasor Assoc Inc, Sunnyvale, Calif). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 2: 1968-1973(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

Applications of thermionic converters require that a large number of converters be connected together in a series-parallel array in order to provide a useful output voltage. Such an array also serves to insure a very high overall system reliability, despite possible failures of individual converters. This paper predicts the effects of a nonuniform distribution of input power on the performance of such an array. 9 refs.

63152 **Characteristics of cvd silicon carbide thermionic converters.** Goodale, D.B.; Reagan, P.; Miskolczy, G.; Lieb, D.; Huffman, F.N. (Thermo Electron Corp, Waltham, Mass). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 2: 1974-1978(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

A composite hot shell-emitter structure incorporating the protective coating (CVD silicon carbide) and the emitter (CVD tungsten) has been developed. Long term life tests of one-inch diameter hemispherical converters utilizing composite hot shells are discussed. Composite hot shell-emitter structures have been subjected successfully to severe mechanical, thermal shock and thermal cycle tests. 5 refs.

63153 **High temperature cogeneration with thermionic burners.** Fitzpatrick, G.O.; Britt, E.J.; Dick, R.S. (Rasor Assoc Inc, Sunnyvale, Calif). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 2: 1951-1955(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

Cogeneration systems can be designed to meet the greater industrial requirements for high temperature direct heat, typically hot gas above 800 K (980/degree/F). This need can be met by integrating thermionic converters into a high combustion rate burner. Such a thermionic combustor has been designed which can serve as a burner replacement in most industrial applications. 7 refs.

63154 **Thermionic converters for increased performance in gas turbine power plants.** Fitzpatrick, G.O.; Britt, E.J.; Dick, R.S.; Lohneiss, R.F.; Sederquist, R.A.; Lehman, S.J. (Rasor Assoc Inc, Sunnyvale, Calif). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 2: 1962-1967(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

A study to evaluate the use of thermionic combustors in integrated gas turbine combined cycle-gasification power plants was performed. The flame temperature available in the combustor of a gas turbine exceeds 2477 K (4000 F), yet due to materials problems, presently available gas turbines are operated with turbine inlet temperatures little more than 1366 K (2000 F). 6 refs.

63155 **Thermionic combustor application to combined gas and steam turbine power plants.** Miskolczy, G.; Wang, C.C.; Lieb, D.P.; Margulies, A.E.; Fusegni, L.J.; Lovell, B.J. (Thermo Electron Corp, Waltham, Mass). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 2: 1956-1961(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

The engineering and economic feasibility of a thermionic converter topped combustor for a gas turbine is evaluated in this paper. A combined gas and steam turbine system was chosen for this study with nominal outputs of the gas and steam turbines of 70 MW and 30 MW, respectively. 7 refs.

3005 Fuel Cells

REFER ALSO TO CITATION(S) 63094

63156 **Status of molten carbonate fuel cell program.** Krumpelt, M.; Ackerman, J. (Argonne Natl Lab, Ill). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 1: 699-702(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

The Department of Energy (DOE) is sponsoring a program to develop molten carbonate fuel cells. These advanced fuel cells promise coal-to-bus-bar efficiencies of about 50% and are environmentally very attractive. Although oil and gas can be used as fuel with up to 60% efficiency, the main application is anticipated in conjunction with coal gasifiers. 6 refs.

63157 **Carbonate fuel cell technology progress.** Dawes, M.H.; Peterson, J.R. (GE, Schenectady, NY). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 1: 703-707(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

The carbonate fuel cell is projected to achieve the performance, life and cost goals necessary for application to base load electrical power generation. The implications of recently completed long-term endurance testing are described, as is progress in corrosion control. The status of work directed toward low-cost cell materials is summarized. 2 refs.

3008 Miscellaneous Converters

63158 **Regenerative pyroelectric heat engine.** Olsen, R.B.; Briscoe, J.M. (Power Convers Technol Inc, San Diego, Calif). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 3: 2081-2085(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

A single-stage regenerative pyroelectric heat engine has been built and tested. The pyroelectric engine converts heat directly into electrical energy. The efficiency of the conversion process was directly measured (the first such measurement for any pyroelectric conversion process). The measured 0.4% efficiency is 20 times larger than the so-called van der Ziel limit. 12 refs.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

REFER ALSO TO CITATION(S) 63119

3201 Buildings

REFER ALSO TO CITATION(S) 62897, 63109, 63128

63159 **(GAO/PLRD—82-90) GSA could do more to improve energy conservation in new federal buildings.** (General Accounting Office, Washington, DC (USA). Procurement, Logistics, and Readiness Div.). 12 Jul 1982. 37p. General Accounting Office, PO Box 6015, Gaithersburg, MD 20760.

Report to the Administrator of General Services. Portions of document are illegible.

Newly constructed federal buildings have used 20% to 203% more energy annually than they were designed to consume. GSA has rejected some federal building designs because of such problems as inadequately designed energy conservation features. GSA has started actions to improve the design process, but to provide greater assurance that the energy usage goals will be met, GSA needs to (1) make known to future building designers its experiences gained about energy conservation on prior projects, and (2) increase its commitment to designing energy conservation in new federal buildings.

63160 **(K/CSD/INF—82/6) Large climate-moderating envelopes for enclosed structures: a preliminary evaluation of energy-conservation potential.** Giles, G.E.; Park, J.E.; Wendt, R.L. (Oak Ridge Gaseous Diffusion Plant, TN (USA); Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 24p. (CONF-821101—1). NTIS, PC A02/MF A01. Order Number DE82012817.

From ASME winter annual meeting; Pheonix, AZ, USA (14 Nov 1982).

Portions of document are illegible.

A preliminary estimate is given of the energy conservation benefits of a large climate-moderating envelope (LCME). A hypothetical LCME design was chosen and a coupled fluid dynamic and energy transport analysis was performed to estimate the energy conservation potential of this design. The heat transfer models included insolation, outside air temperature and wind, thermal radiation exchange with the sky, thermal radiation exchange between the fabric and ground, and thermal storage in the earth mass beneath the LCME. The energy transported within the fluid by the buoyancy-driven circulation was modeled as an incompressible fluid utilizing the Boussinesq approximation. The climatic conditions were assumed to vary in smooth, repeating daily cycles. The numerical simulation of climatic variation was continued until the results within the LCME achieved a repeating daily cycle. The results for selected seasonally characteristic days were utilized to estimate the annual energy consumption of structures within an LCME relative to similar structures exposed to the exterior environment. The relative annual energy savings for summer-dominated climates was estimated to be ~ 70%. The energy savings for a winter-dominated climate LCME were estimated to be somewhat smaller, ~ 40%. The radiative properties of the membrane that isolates the intermediate climate can be chosen to produce an effective passive solar system for summer-dominated climates.

63161 **(K/CSD/INF—82/6-R1) Large climate-moderating envelopes for enclosed structures: a preliminary evaluation of energy-conservation potential.** Giles, G.E.; Park, J.E.; Wendt, R.L. (Oak Ridge Gaseous Diffusion Plant, TN (USA); Oak Ridge National Lab., TN (USA)). Jun 1982. Contract W-7405-ENG-26. 9p. (CONF-821101—1-Rev.1). NTIS, PC A02/MF A01. Order Number DE82018350.

From ASME winter annual meeting; Pheonix, AZ, USA (14 Nov 1982).

One method of reducing the energy consumption of one or more buildings is to isolate the buildings within a large envelope. The envelope moderates the effects of sun, wind and precipitation and provides a more benign climate for habitation, commerce and, in some climates, agricultural activities. Results of a preliminary study of the qualitative energy conservation benefits are given for a large climate-moderating envelope (LCME). The study included the effects of weather, fluid circulation and radiant transport within the envelope and energy storage in the earth mass beneath the LCME. Based on model studies for selected days, the annual energy savings for summer-dominated climates was estimated to be ~ 70%. The energy savings for a winter-dominated climate LCME were estimated to be somewhat smaller, ~ 40%.

63162 **(LBL—14626) Validation of a passive sampler for determining formaldehyde in residential indoor air.** Hodgson, A.T.; Geisling, K.L.; Remijn, B.; Girman, J.R. (Lawrence Berkeley Lab., CA (USA)). Sep 1982. Contract AC03-76SF00098. 29p. NTIS, PC A03/MF A01. Order Number DE83001226.

A passive sampling device based on the principle of diffusion has been developed specifically for the determination of formaldehyde in residential indoor air. The device, which is inexpensive and easy to use, is capable of measuring one-week time-weighted average concentrations of formaldehyde from as low as 0.018 ppM to over 1 ppM. The sampler was validated by a series of laboratory experiments and a field study conducted in occupied residences and an office. The parameters evaluated in the laboratory and field experiments were: sampling rate; sampling period; detection limit; relative humidity effects; chemical interferences; shelf life; sample stability; overall precision; bias; and overall accuracy. The performance of the passive sampler compared favorably to that of a reference pump/bubbler sampler.

63163 **(LBL—14651) Measured energy savings from two lighting control strategies.** Rubinstein, F.; Karayel, M. (Lawrence Berkeley Lab., CA (USA)). Jun 1982. Contract AC03-76SF00098. 9p. (CONF-821008—2). NTIS, PC A02/MF A01. Order Number DE82018778.

From IEEE annual meeting of the Industry Applications Society; San Francisco, CA, USA (4 Oct 1982).

The energy-saving benefits of two lighting control strategies - scheduling and daylighting - were investigated at demonstration sites in two large commercial buildings. A continuously-dimmable lighting control system was installed at the Pacific, Gas & Electric Co. building in San Francisco and an on/off switching system was installed at the World Trade Center building in New York City. By automatically scheduling the operation of the lighting systems to conform with occupancy patterns, lighting energy consumption was reduced 10 to 40%. Several scheduling techniques were investigated and the influence of switching zone size on energy savings was examined. Using photo-electrically controlled lighting systems which switch or dim lighting in accordance with available daylight, the energy consumed for lighting in daylit areas was reduced 25 to 35%. The influence of clear and overcast conditions on the energy savings associated with daylight-linked controls is discussed.

63164 **(LBL—14788) Monitored low-energy houses in North America and Europe: a compilation and economic analysis.** Ribot, J.C.; Rosenfeld, A.H. (Lawrence Berkeley Lab., CA (USA)). Aug 1982. Contract AC03-76SF00098. 21p. (CONF-820849—8). NTIS, PC A02/MF A01. Order Number DE82021789.

From Summer study in energy efficient buildings; Santa Cruz, CA, USA (22 Aug 1982).

In a continuing compilation, BECA-A (Building Energy-Use Compilation and Analysis, Part A, New Homes), 128 submetered, energy-efficient homes in North America and Europe have been analyzed. Only 59 have acceptable data on additional first cost of conservation measures. Of these, the lowest cost of conserved energy is for the superinsulated category, where the cost of conserved energy is well under the average price of electricity, i.e. 6.2 cents/kWh. Only 37 homes have submetering adequate to permit correcting space heating loads for variations in occupant behavior (thermostat setting and internal gains). For these 37, the mean standardized thermal integrity is 50.3 kJ/m^3-DD, compared to US 1979 building practice of 100, or US stock of 180.

63165 **(LUTVDG/(TVBH—1003)/1-165/(1981)) Active heat capacity. Models and parameters for the thermal performance of buildings.** Johannesson, G. (Lund Univ. (Sweden)). May 1981. 165p. NTIS (US Sales Only), PC A08/MF A01. Order Number DE82750066.

The thesis concerns the characterization and evaluation of nonsteady heat transfer in building components and building enclosures. The major aim of the underlaying research has been to assemble and develop simplified calculation procedures for this purpose. To establish a simple model for heat balance calculations three items are treated: (1) simplification of the heat transfer operators. (2) the description of the solar gain through windows. (3) reduction of the number of transfer paths. For nonsteady heat conduction in opaque construction solutions are given for the frequency domain and by finite differences. Based on the frequency response different types of RC-models are derived. The simplest network is a single capacitance giving the same ratio between the amplitudes of heat flow and temperature of the real surface. This quantity is called the active heat capacity of the wall. To estimate this quantity a simplified calculation procedure is given. For the combination of surfaces with different active heat capacities factors are established that take into account the limitied mutual radiation exchange between surfaces. In that way the room is transformed into a model with two nodes, one representing the surface temperature and one representing the room air. A solution in the time domain allows the thermal loads to be represented as time series and the mode of operation can be freely defined and varied during the calculated period.

63166 **(NP—2906049) Energy conservation design manual for new nonresidential buildings. First edition.** (California Energy Resources Conservation and Development Commission, Sacramento (USA). Conservation Div.). Oct 1977. 396p. California Energy Resources Conservation and Development Commission, 1111 Howe Ave., Sacramento, CA 95825.

Portions of document are illegible.

The procedures, calculations, and documentation which must be completed before an application for a building permit is made in California are described. Also discussed are the methods and techniques required by the regulations, and blank copies of the recommended compliance forms to be filed with the building department at the time of application are included. All necessary reference data for completing the forms are appended. The standards are minimum requirements; additional measures that can be taken to further reduce the energy consumed by buildings are discussed. Compliance procedures and a simple method of checking the required documentation are provided for the building official. (LEW)

63167 **(ORNL/CON—71) Residential energy-tax-credit eligibility: a case study for the heat-pump water heater.** Cohn, S.M.; Cardell, N.S. (Oak Ridge National Lab., TN (USA)). Sep 1982. Contract W-7405-ENG-26. 61p. NTIS, PC A04/MF A01. Order Number DE82021109.

Described are the methodology and results of an analysis to determine the eligibility of an energy-efficient item for the residential energy-tax credit. Although energy credits are granted only on a national basis, an attempt to determine the tax-credit eligibility for an item such as the heat-pump water heater (HPWH) analyzing national data is inappropriate. The tax-credit eligibility of the HPWH is evaluated for the ten federal regions to take into consideration the regional differences of: (1) HPWH annual efficiency, (2) existing water heater stocks by fuel type, (3) electricity, fuel oil, and natural-gas price variations, and (4) electric-utility oil and gas use for electricity generation. A computer model of consumer choice of HPWH selection as well as a computer code evaluating the economics of tax-credit eligibility on a regional basis were developed as analytical tools for this study. The analysis in this report demonstrates that the HPWH meets an important criteria for eligibility by the Treasury Department for an energy tax credit (nationally, the estimated dollar value of savings of oil and gas over the lifetime of those HPWH's sold during 1981 to 1985 due to the tax credit exceeds the revenue loss to the treasury). A natural-gas price-deregulation scenario is one of two fuel scenarios that are evaluated using the equipment choice and tax-credit models. These two cases show the amounts of oil and gas saved by additional HPWH units sold (due to the tax credit during 1981 to 1985 (range from 13.9 to 23.1 million barrels of oil equivalent over the lifetime of the equipment.

63168 **(P—400-82-054) Energy-conservation standards for new nonresidential buildings.** (California Energy Resources Conservation and Development Commission, Sacramento (USA)). Jul 1982. 81p. California Energy Commission, 1111 Howe Ave., Sacremento, CA 95825.

Portions of document are illegible.

This administrative code contains the following: administrative regulations, building regulations applicable to all occupancies, building regulations applicable to new nonresidential buildings, standards referenced in Energy Conservation Regulations, and building regulations applicable to ducts.

63169 **Proceedings documents for wood heating seminars, 1980/1981.** Washington, DC; Wood Heating Alliance (1981). 282p. (NP—2904703). Wood Heating Alliance, 1101 Connecticut Avenue, N.W., Suite 700, Washington, DC 20036.

Seventeen papers were abstracted and eleven abstracts listed by title.

63170 **Efficient wood stove design and performance.** Hayden, A.C.S.; Braaten, R.W. (CANMET, Ottawa, Ontario). pp 16-43 of Proceedings documents for wood heating seminars, 1980/1981. Washington, DC; Wood Heating Alliance (1981).

From 6. Wood heating seminar; Atlanta, GA, USA (25 Feb 1980).

Performance of four wood stove designs - a freestanding fireplace and three airtight stoves, an updraft (box), horizontal (Scandinavian) baffle and a sidedraft - are presented. The sidedraft design and, to a lesser extent, the horizontal baffle design offer performance advantages over the other two types. Tests were performed in the laboratory using the Indirect Method with continuous measurement. In-situ trials in test homes are also discussed.

63171 **Wood heat emission workshop.** Knight, D.K. pp 73-86 of Proceedings documents for wood heating seminars, 1980/1981. Washington, DC; Wood Heating Alliance (1981).

From 6. Wood heating seminar; Atlanta, GA, USA (25 Feb 1980).

Problems involved in a demonstration program for the selection, proper installation, and inspection of 6000 wood heaters in 65 counties of the TVA region are discussed. Air quality in the region and testing of the six wood heaters involved are described.

63172 **Coal fired heating in the British home.** Kaye, W.G.; Lake, J.M.; Payne, R.C. pp 88-108 of Proceedings documents for wood heating seminars, 1980/1981. Washington, DC; Wood Heating Alliance (1981).

From 7. Wood heating seminar; Denver, CO, USA (27 Aug 1980).

A description is given of the standards to which approved solid fuel appliances must conform for the UK market and of how for these requirements are met in modern appliance design. A review is also given concerning the development of appliances for the residential market.

63173 **Consumer sales techniques: manufacturers case studies.** Chase, J.R. (Hearth Shield/Heat Safe, Lebanon, NJ). pp 109-112 of Proceedings documents for wood heating seminars, 1980/1981. Washington, DC; Wood Heating Alliance (1981).

From 7. Wood heating seminar; Denver, CO, USA (27 Aug 1980).

Three case studies are presented which focus on marketing errors by wood stove manufacturers which ultimately can result in failure. The fourth case study is a scenario for success.

63174 **Preliminary look at some of the factors affecting the design and use of coal stove space heaters and furnaces in the United States.** Page, C. (Vermont Castings, Inc., Randolph). pp 113-138 of Proceedings documents for wood heating seminars, 1980/1981. Washington, DC; Wood Heating Alliance (1981).

From 7. Wood heating seminar; Denver, CO, USA (27 Aug 1980).

Factors which must be dealt with before coal can become a popular home heating fuel again are discussed, as follows: transportation and distribution system, coal stove space heater and furnace design, coal stove and furnace emissions, and state and federal regulations. Characteristics of coal that can lead to problems for the homeowner are described. The advantages and disadvantages of the three major coal stove space heater designs are discussed.

63175 **Control of emissions from residential wood burning by combustion modification.** Allen, J.M. (Battelle-Columbus Labs., OH). pp 167-190 of Proceedings documents for wood heating seminars, 1980/1981. Washington, DC; Wood heating alliance (1981).

From 8. Wood heating seminar; New Orleans, LA, USA (21 Feb 1981).

The burning characteristics of wood, types of stoves, and the experimental program at Battelle are discussed. Variables affecting emissions are discussed including: burning rate, mode of burning, combustion air preheat, secondary combustion, amount of wood charged, wood size and shape, and moisture content of wood. Testing of a commercial high turbulence burner is described.

63176 **Domestic hot water and hydronics installations.** Deats, R.A. pp 191-220 of Proceedings documents for wood heating seminars, 1980/1981. Washington, DC; Wood Heating Alliance (1981).

From 8. Wood heating seminar; New Orleans, LA, USA (21 February 1981).

Hot water heating systems and the use of solid fuels for them are discussed. The pitfalls which beset retailers of heating systems through inadequate installers are described. Warnings are issued regarding selling retrofit equipment to a customer whose basic systems is inadequate. Various types of installations are described and illustrated.

63177 **(NP—2905798) Contribution to efficient use of primary energy in space heating.** (Kabel- und Metallwerke Gutehoffnungshuette A.G., Hannover (Germany, F.R.)). [nd]. 22p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82905798.

The article shows that optimal utilization of primary energy in room heating mainly depends on two parameters: the thermal insulation in a house and the degree of primary energy utilization. The high-temperature heat generated in a power plant should at first be used to generate mechanical energy with the help of which the ambient heat can be brought to the temperature level necessary for room heating. Soil, ground water, and ambient air can be used as heat sources for heat pumps. For an energy roof with solar collectors, an additional heating is proposed which can be used instead of the heat pump during the extremely cold periods.

3202 Transportation

REFER ALSO TO CITATION(S) 63210

63178 **(DOE/CS/50095—T2) Blade erosion effects on aircraft-engine compressor performance. Final report, September 1, 1979-March 31, 1982.** Schwind, R.G.; McMillan, O.J. (Nielsen Engineering and Research, Inc., Mountain View, CA (USA)). Sep 1982. Contract AC03-79CS50095. 56p. NTIS, PC A04/MF A01. Order Number DE82021791.

Results are presented from a research program intended to allow prediction of changes in JT8D compressor performance due to blade-shape changes caused by erosion. A review of pertinent literature is included in which the mechanisms responsible for turbine-engine performance deterioration are discussed. Profile measurements of new blades for the JT8D-7 engine are given, and the level of variability among different samples of new blades established. To allow assessment of the areas in the compressor where blade-shape changes due to erosion are important in comparison to this new-blade variability, measurements of corresponding sections of used blades have also been made. The change in blade-element performance associated with a particular shape change for one of these blade sections is calculated; the major effect predicted is a considerable loss of turning by the blade element. The means by which these results can be used to calculate changes in overall compressor performance are indicated.

63179 **(DOE/NV/10291—T1) Follow-up study to the driver-energy conservation-awareness training program (DECAT). Final report.** (Orkand Corp., Silver Spring, MD (USA)). 1 Sep 1982. Contract AP08-82NV10291;AC01-80CS50153. 125p. NTIS, PC A06/MF A01. Order Number DE82020584.

Portions of document are illegible.

To assist in alleviating the pressures placed on fleet managers as a result of rising petroleum prices, the Vehicle Performance Branch within the Office of Conservation and Renewable Energy, DOE, developed the DECAT Program. The purpose of DECAT is to provide organizations with the information they need to reduce their fuel consumption by at least 10 percent. This is accomplished through a specially designed program that shows vehicle operators four techniques for cutting fuel use - trip planning, vehicle selection, vehicle maintenance, and improved driving skills. DECAT is targeted towards employer groups operating company motor pools within the government and business sectors. The purpose of this evaluation is twofold: (1) to assess the effectiveness of the DECAT course in meeting user needs; and (2) to provide information on program areas requiring revision, improvement or update. In total, 75 individuals were selected for interview out of a total population of 155 graduates who attended the course over the period May 1979 to June 1980, inclusive. These individuals were interviewed by telephone and the results of their discussions were coded and analyzed using the Statistical Package for the Social Sciences (SPSS).

63180 **(GAO/PLRD—82-74) Aircraft thrust/power management can save defense fuel, reduce engine maintenance costs, and improve readiness.** Bowsher, C.A. (General Accounting Office, Washington, DC (USA). Office of the Comptroller General). 29 Jul 1982. 50p. General Accounting Office, PO Box 6015, Gaithersburg, MD 20760.

Report to the Chairman, Subcommittee on Defense, Committee on Appropriations, House of Representatives.

The Department of Defense could achieve additional savings in aircraft fuel and reduce engine maintenance costs by making greater use of reduced power takeoffs and climbs by fighter aircraft, where feasible. Commercial airlines and larger military aircraft have used reduced power for several years, with positive results. Some bases have adopted fuel-efficient procedures, which result in significant differences in fuel consumption in the same type of aircraft. Effective local initiatives should be better identified, reviewed, and implemented servicewide whenever feasible.

63181 **(PB—82-100538) Investigation of truck size and weight limits: technical supplement. Volume 3. Truck and rail fuel effects of truck size and weight limits. Final report, October 1978-June 1981.** Knapton, D.A. (Department of Transportation, Cambridge, MA (USA). Transportation Systems Center). Jul 1981. 142p. NTIS, PC A07/MF A01.

Data and indirect fuel consumption for new truck size and weight limits are presented. These effects are examined in terms of changes in the competitive relationships between highway and rail services. The method for estimating fuel consumption includes line haul and access fuel and makes allowance for the system fuel requirements of empty backhaul and circuitry. Single unit trucks, conventional tractor-semi-trailer, Western Doubles, Turnpike Doubles, and Triple Trailer combination rigs as well as the competitive carload boxcar and TOFC rail services are considered. Truck service (i.e., van, reefer, household moving van, flat bed, tanker and dump), and the competitive rail services are disaggregated.

63182 **Prospects for improved fuel economy and fuel flexibility in road vehicles.** Francis, R.J.; Woollacott, P.N. London, England; Her Majesty's Stationery Office (1981). 118p. (NP—2906471). H.M.S.O., London, England, £ 6.20.

Various technical options for improving the fuel economy and fuel flexibility of road vehicles in the United Kingdom are examined. Fuel economy can be improved with sacrifice of performance through the development of engines, transmissions and complete vehicles. Improved fuel flexibility depends entirely on engine developments. The operation, performance, and prospects for improved performance of Otto, diesel, gas turbine, Stirling cycle, Brayton cycle, and Rankine cycle automotive engines, and of electric and hybrid electric-powered vehicles, are discussed. Transmission improvements are described. Estimates are made of possible savings of crude oil as the result of using vehicles with improved economy. It is concluded that it should be possible to improve the fuel economy of automobiles by 50% and of trucks by 15%; fuel consumption improvements for advanced conventional engines will exceed those for gas turbine engines or Stirling engines, but these external combustion engines have wider fuel tolerance, better emission characteristics and less noise; and electric vehicle development should be pursued. Considering projected traffic growth, it is estimated that the 50% car and 15% truck fuel economy improvement would result in a fuel saving equivalent to about 40% of the total fuel consumption by all UK vehicles in 1978. (LCL)

3203 Industry And Agriculture

REFER ALSO TO CITATION(S) 62810, 63357

63183 **(BMFT-FB-T—82-044) Low emission high economical wire enamelling machines.** Grahl, O. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Apr 1982. 54p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750629.

The former process and equipment for wire enamelling machinery was based on the use of enamels with high content of solvents. The pollutant emission is too high. This work is aimed to develop processes and equipment by taking into account new insulation materials which have been developed by the chemical industry. The wire enamelling machines, developed and bult during this project period are suited to utilize the new types of hot melt resins and enamels. They also fulfill in an economical way all requirements to keep the air clean by using not only the new materials but also enamels with solvents.

63184 **(DOE/ET/15426—T23) RIT rotor vibration testing. Test report.** (Northern Research and Engineering Corp., Woburn, MA (USA)). 27 Sep 1982. Contract AC03-79ET15426. 27p. NTIS, PC A03/MF A01. Order Number DE82021024.

Portions of document are illegible.

A radial inflow turbine (RIT) B rotor, including the impeller and shaft, was examined experimentally to determine vibratory characteristics. It was concluded that there are no specific speeds within the operating range with adequate resonance encroachment margins. It is recommended that performance tests be carried out with caution.

63185 **(DOE/ET/15426—T24) RIT pre-shipment checkout. Test report.** (Northern Research and Engineering Corp., Woburn, MA (USA)). 2 Sep 1982. Contract AC03-79ET15426. 11p. NTIS, PC A02/MF A01. Order Number DE83000056.

Portions of document are illegible.

The radial inflow turbine (RIT) unit was successfully air-run up to 26,000 rpm under no-load to check unit and system operation prior to shipment to Terry Corporation. Results were all nominal; no anomalies were uncovered. Recommendations are included which deal with minimum shaft loading during idle and the avoidance of condensate in the flow path.

63186 **(NP—27500XX) Utilization and disposal of fly ashes from Danish power plants.** Jensen, S.A. (Jysk-Fynske Elsamarbejde (ELSAM), Fredericia (Denmark)). Sep 1980. 32p. (In Danish). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750074.

Fly ashes from the fossil-fuel power plants have various particulate size depending on coal origin, boiler type and filter type. Environmental effects of ash utilization with prospective elution or ash disposal are affected by the particulate size. This problem is elucidated. Use of fly ashes in the concrete and cement industry is described and conditions of ground disposal are considered. Administrative procedures required to establish a safe disposal without dangers for ground water pollution are described.

63187 **(STU—79-4988) Improved exploitation of energy at drying of materials.** Wimmerstedt, R.; Hallstroem, A.; Nilsson, L. (Styrelsen foer Teknisk Utveckling, Stockholm (Sweden)). Nov 1980. 12p. (In Swedish). (STU—77-7512; STU—78-4769). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82750073.

The report deals with three projects which have increased knowledge of the mass and heat transport in the material to be dried. Industrial drying processes of two materials, namely a crystallaine organic substance and a fertilizer have been studied. The third project concerns the construction of a fluidized bed dryer on a pilot plant scale. The results show that considerable saving of energy could be obtained by the optimization of industrial techniques.

63188 **(TVA/PUB—82/12) Solid-waste-management policy analysis.** Cox, D.B.; Ginn, R.H.; Giordano, P.M.; Hodges, J.C.; Mummert, P.J.; Needy, J.L.; Parker, F.G.; Patterson, D.A.; Point, J.N. (Tennessee Valley Authority, Chattanooga (USA); Tennessee Valley Authority, Muscle Shoals, AL (USA); Tennessee Valley Authority, Knoxville (USA)). Nov 1981. 71p. NTIS, PC A04/MF A01. Order Number DE82905985.

Portions of document are illegible.

TVA's role in solid waste management community assistance activities has evolved and undergone program modification over the past decade. The purpose of this policy analysis is to determine the need for appropriate changes in program emphasis in light of TVA's corporate objectives in economic development and resource conservation. Additional reasons which warrant evaluation of TVA's future role in this area include increased Federal emphasis on states, local government, and the private sector shouldering major responsibilities for meeting local/regional solid waste management needs. Review of TVA solid waste program activities over the past five years revealed that budgets and staff time have been concentrated in the following priority areas: (1) energy-from-waste, (2) collection and disposal of municipal wastes, (3) disposal and utilization of municipal wastewater sludge, (4) hazardous waste management, and (5) resource recovery and recycling. Office of Economic and Community Development (OECD) supports the interoffice team recommendation to shift TVA's program emphasis in the future to the following areas of priority: (1) hazardous waste management; (2) resource recovery and recycling, especially of industrial waste; (3) collection and disposal of municipal wastes; (4) energy-from-waste; and (5) disposal and utilization of municipal sludge. The most immediate change resulting from the team's recommendations would be a scaling down of TVA's activities in

energy-from-waste and in design assistance to local governments in collection and disposal of municipal wastes.

63189 **Future for indirect coal-fired gas turbine cogeneration systems.** Wilkinson, W.H. (Battelle, Columbus Lab., Ohio). *Proceedings, Intersociety Energy Conversion Engineering Conference;* 1: 497-502(1981). (CONF-810812—).

From IECEC conference; Atlanta, GA, USA (9 Aug 1981).

This paper shows that superior load-following performance of closed-cycle gas turbines (Brayton) makes them excellent candidates for cogeneration applications. Characterizations show preferred means for independently varying power and process heat.

3206 Municipalities And Community Systems

REFER ALSO TO CITATION(S) 62700, 62700, 63188

63190 **(BMFT-FB-T—82-046) Optimization and control of the activated sludge process by adaptation of aeration tank volume.** Staud, R. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Apr 1982. 151p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82750633.

Purpose of full scale studies conducted at a municipal wastewater treatment plant at Schwetzingen, Germany, was to optimize the activated sludge treatment process. Influent loading fluctuations were answered by operating a distinct number of the four parallel treatment plant units (aeration tank/clarifier) present. During the intermediate period of time the aerators were also switched off, and the activated sludge was kept anaerobically. The purpose of this particular technique is to equalize the nutrient supply of the microorganisms to gain an improved metabolic potential, as well as to decrease the energy demand for aeration. A mathematical algorithm for process control was developed to accomplish this technique. Initial parameters are inflow rate, MLSS and plateau-BOD to evaluate the substrate concentration. The results of the full scale studies prove the practicability of this concept. Equalization of the F:M ratio fluctuations leads to an increase of the average substrate loading but not to any decrease in the overall process efficiency. Anaerobic sludge storage did not cause any problem. Odor problems could be handled by limitation of the storage period to 24 hours. As far as energy consumption for aeration is concerned a decrease by 47% percent could be achieved.

63191 **(CONF-790280—) Proceedings of the 1979 rate symposium on problems of regulated industries.** (Missouri Univ., Columbia (USA)). 1979. 534p. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

Portions of document are illegible.

This volume contains the papers, discussions, and comments presented at the 1979 Rate Symposium on Problems of Regulated Industries. The primary purpose of the Symposium is to contribute to the development of practical solutions to the rate design problems of the regulated industries. The organization of this volume parallels the organization of the Symposium program. Papers are grouped under the folowing sections: (1) Probable Effects of the National Energy Plan and the Department of Energy's Policies and Programs; (2) Problems and Progress in Electrical Utility Rate Design; (3) Natural Gas Price Regulation; (4) Costing and Pricing Communication Services; (5) Evaluation of Progress Toward Ratemaking Objectives of the 4-R Act; (6) Theory and Practice of Deregulation and Encouragement of Competition. Selected papers from sections 1 to 3 have been abstracted and indexed.

63192 (CONF-790280—, pp 49-54) **Energy supply and the implementation of federal policies.** Jones, R.D. (LeBoeuf, Lamb, Leiby, and MacRae, New York, NY). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

The goals of the Public Utility Regulatory Policies Act (PURPA) and the effects of its implementation are discussed. These effects include the higher utility rates needed to cover the costs of supplying the US FERC with plant operations data, cost of rate case interventions, cost of more personnel at the FERC and DOE involved in ratemaking functions, and the cost of making plant modifications to comply with regulations. The risks of PURPA implementation include: the possibility of making the price of natural gas uncompetitive with other fuels for industrial use; scaring investors away from utilities which must face prolonged rate-making procedures; and giving regulatory bodies an increasingly more powerful role in the operations of utilities. (LCL)

63193 (CONF-790280—, pp 91-102) **National energy legislation and state utility commissions: an overview.** Perry, H. (Dept. of Energy, Washington, DC). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

The impact on the responsibilities and deliberations of state utility commissions from five pieces of national energy legislation signed into law in November 1978 are reviewed. These laws are: the Public Utility Regulatory Policies Act (PURPA; P.L. 95-617); the National Energy Conservation Policy Act (NECPA; P.L. 95-619); the Powerplant and Industrial Fuel Use Act (FUA; P.L. 95-620); the Natural Gas Policy Act (NGPA; P.L. 95-621); and the Energy Tax Act (ETA; P.L. 95-618). Each Act is discussed. The role of the Department of energy in implementing the legislation is described, and schedule for 1979 of DOE activities related to this implementation is outlined. (LCL)

63194 (CONF-790280—, pp 103-125) **Public Utility Regulatory Policies Act and the Electric Utility Rate Design Study.** Uhler, R.G. (Electric Power Research Inst., Palo Alto, CA). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

The original requestors of the Electric Utility Rate Design Study - the National Association of Regulatory Utility Commissioners (NARUC) - recently asked the Study to summarize the information developed in it in terms of the Public Utility Regulatory Policies Act of 1978 (PURPA). A first draft containing this information and other matters was delivered to NARUC on 9 February 1979 for their review and comment. A part of that report follows. Further changes are anticipated but it does provide a clear and comprehensive guide to the substantive information developed in the Rate Design Study in terms of PURPA. Generally, under PURPA each State commission has three primary responsibilities: making a determination to implement or to decline to implement six ratemakig standards listed in Section 111 of Title I; making a determination to adopt or not to adopt five certain standards listed in Section 113 of Title I; and making a determination whether or not a lifeline rate should be implemented, as described in Section 114 of the Title. In addition, the State commissions have numerous secondary - but still important - responsibilities. These are discussed. To put the bits and pieces together, a schematic of PURPA shows these responsibilities. Each section of PURPA is discussed in terms of information developed for the Rate Design Study. A matrix that links the various sections of PURPA to the Study reports is attached.

63195 (CONF-790280—, pp 126-152) **Impact of experimental residential rates in Arizona.** Hart, B.P. (Arizona Public Service Co., Phoenix). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

Two time-of-use (TOU) rate experiments conducted by the Arizona Public Service Co. (APS) to determine the effect of rate structures on residential electric power consumption and on the shifting of power demand to off-peak hours are described. The first test, conducted during 1976 to 1979 had 32 rate schedules, based only on consumption, which were designed only to evaluate the consumption shift from peak to off-peak periods. The second test, scheduled to begin in 1979, will provide information on customer

reactions to TOU pricing, cost/benefits to the utility, performance of equipment, and experience upon which to base future rate schedules. From analysis of Test I it was concluded that there has been a shift in energy consumption from peak to off-peak periods; however, peak demand has not shifted correspondingly. Thus, desired shifts of peak demand in APS regions having high cooling requirements are doubtful with rates based only on energy (KWh) consumption. It is anticipated that the new test with timed demand and energy will show a demand response proportionate to the energy response.

63196 (CONF-790280—, pp 153-178) **Connecticut peak load pricing experiment.** Brown, R.H. (Northeast Utilities Service Co., Hartford, CT). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

The results of the 1975-1976 peak load pricing experiment involvig residential customers in Connecticut are presented and discussed. These results include the following findings: residential time-of-use rates can induce significant changes in customer usage patterns; the connecticut test results have been accepted by the company, intervenors and our regulatory commission and are reflected in permanent residential time-of-use rates that are now in effect; time-of-use rates are not sufficient by themselves to capture the full load shifting potential of residential users; there is a role for other load management techniques, quite apart from time-of-use rates; and residential users can adapt to time-of-use rates in the short run without severely disrupting their life styles.

63197 (CONF-790280—, pp 179-194) **Does time-of-use pricing work.** Abdoo, R.A. (WEPC, Milwaukee, WI). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

The Wisconsin Electric Power Co. program on time-of-use rates for commercial and industrial customers is discussed, and the findings of analyses of the impact of this rate structure on power load curve shapes and on peak demand are described. This study has not identified any large changes which have occurred in either customers' overall load shapes or in their contributions to peak. Even with no response, however, Wisconsin Electric would be satisfied with the time-of-use rates simply because they were instituted primarily to give customers the right price signal. Changes in peak demand and load shape are only secondary considerations. The first year of time-of-use rates had a small impact on customers' load, but it is an impact that will grow over time. To begin with, Wisconsin Electric had a demand forgiveness clause so the time-of-use rates were not drastically different. In addition, the potential impact on customers' bills was deliberately kept to a minimum. In subsequent rate cases, the time-of-use rate will move closer to the company's marginal costs. As this occurs greater impacts are expected. Finally, as individual firms make decisions on capital replacements or additions, they now have the opportunity to design processes to take advantage of time-of-use rates. This also supports the conclusion of a growing impact over time.

63198 (CONF-790280—, pp 195-206) **Experience with rates for large commercial and industrial customers in California.** Gallavan, W.M. (Pacific Gas and Electric, San Francisco, CA). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

The time-of-use (TOU) rate schedule used by the Pacific Gas and Electric Co. for its commercial and industrial customers with maximum demands greater than 4 MW is described. Peak demand and demand shift data for 1977 and 1978 are compared with 1976 (pre-TOU) data. The three main conclusions drawn from this experience with time-of-use rates for large commercial and industrial customers in California are: this rate has caused a reduction in peak demand which is presently rather small, but in the future it may reduce the need for new peak capacity; The adverse impacts of this rate have been small, the time-of-use structure, itself, has not caused a drastic increase in anyone's bill, and the number of workers who have had to change their working hours has been relatively small; and the TOU rate experience has provided only a fraction of the data needed to fully evaluate time-of-use rates, and these data must be supplemented with further experience. (LCL)

63199 (CONF-790280—, pp 207-218) **Regulatory guidelines and standards under the Public Utility Regulatory Policies Act of 1978.** Rudden, R.J. (Stone and Webster Managerial Consultants, Inc., New York, NY). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

The scope of a project designed to provide technical support to DOE in preparing a comprehensive package of guidelines and related resource materials to assist state utility commissions and nonregulated utilities in evaluating the applicability of a wide range of electric utility rate designs and regulatory practices is summarized. The project will develop a comprehensive guidelines package, including user manuals, example applications, and reference sources, which can be utilized to evaluate the following six rate design proposals, i.e., cost of service (CED) rates, declining block rates, time-of-day rates, seasonally varying rates, and interruptible rates, including load management, and lifeline rates. The project will also include methods to evaluate the following six regulatory policies: restrictions on master metering; procedures for automatic adjustment clause review; prohibition of discrimination against solar, wind, or other small energy systems; procedures to provide adequate information to consumers; procedures to protect ratepayers from abrupt termination of service.

63200 (CONF-790280—, pp 226-230) **Public Utility Regulatory Policies Act of 1978 and the Department of Energy intervention program.** Kaplan, C.H. (Dept. of Energy, Washington, DC). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

One or two provisions in the PURPA statute and the DOE intervention program - its origins, its structure and, how the process works within the agency to determine whether the Department will intervene in a particular proceeding - are described. The current case load of the DOE Division of Regulatory Proceedings, its plans for the near future, and how its actions may affect public service commissions and public utilities are discussed. (LCL)

63201 (CONF-790280—, pp 231-240) **Wheeling service alternative rate design.** Sarikas, R.H. (Foster Associates, Inc., Washington, DC). 1979. Extension Publications, University of Missouri-Columbia, 206 Whitten Hall, Columbia, MO 65211 $20.00.

From Rate symposium on problems of regulated industries; Kansas City, MO, USA (11 Feb 1979).

Wheeling has been defined as the transmission of electric power and energy by a system that is neither the source or destination of that power or energy. New authority has been provided the FERC to order a utility to wheel power. However, in order to do so, FERC must find that a wheeling order will: conserve a significant amount of energy; significantly further the efficient use of electric generation and transmission facilities; or, improve the reliability of utility systems without a reduction in the reliability of other systems. Wheeling service, if ordered, must preserve existing competitive relationships; also, FERC may not compel the enlargement of generation facilities. The enlargement of transmission facilities may be ordered if the utility seeking the order will pay th cost of such enlargement. In any event, the utility subject to the order should not incur an uncompensated loss as a result thereof. Methods and considerations are discussed for developing a rate structure which will cover the cost of the wheeling service and will protect the utility providing wheeling service against financial loss due to providing the service. It is concluded that there are substantial questions to be resolved with respect to costing the pricing. It is believed that the well-known methods of incremental and average cost analysis, but not plus adequate recognition of non-cost factors

offer the base promise of wheeling service rates that are equitable, easy to administer, and cause no undue burden on the utility providing such service. The same cooperation that has made pooling a successful endeavor should provide satisfactory answers for the pricing of this class of service.

63202 **(DOE/CS/24315—T3) Elements of trommel dynamics: notes on elementary screening probability.** Renard, M.L. (National Center for Resource Recovery, Inc., Washington, DC (USA)). Sep 1981. Contract AC03-80CS24315. 21p. D. Order Number DE82008668.

The objective of this paper is to document the approach taken in computing a predicted probability of passage for a single municipal waste particle impinging on a screen (dilute case). It is also to discuss how the approach was utilized in sizing particles (model feedstocks, tracers in full scale tests, etc.) so that they would have a given probability of passage upon one single impingement; and evaluated by comparing the predicted probability with experimental values (or rather range of values) determined during screening efficiency tests. The particle typically could be a sphere, cube, or flake. A few examples of applications are given, notably the application to New Orleans Recovery 1 facility. (MCW)

63203 **(DOE/CS/24315—T4) Working paper hardware applications: large trommels.** Clarke, G.V.; Renard, M.L. (National Center for Resource Recovery, Inc., Washington, DC (USA)). 30 Sep 1981. Contract AC03-80CS24315. 69p. NTIS, PC A04/MF A01. Order Number DE82008669.

Portions of document are illegible.

The objective of this report is to give a detailed account of technical work to date with a set of recommendations on municipal solid waste trommel design and construction. The operating experience on the Recovery 1 trommel in operation at the New Orleans resouce recovery plant is reviewed. An attempt was made to characterize the loading (static, dynamic, shock) on a trommel to serve as the basis for formulating external loads in the structural analysis. A structural analysis of the trommel, applicable to the Recovery 1 trommel was developed which can be generalized to and used for other similar trommel configurations. From the numerical application of the analysis to the Recovery 1 trommel, areas of potential structural problems and possible solutions were determined. The soundness of the mode of power driving used in New Orelans Recovery 1 was assessed and its merits were compared to those of other commonly used methods. It is concluded that no one type of power drive is ideal for all types of services. (MCW)

63204 **(DOE/CS/24315—T7) Elements of trommel dynamics: determination of the dynamic bulk density.** Renard, M.L. (National Center for Resource Recovery, Inc., Washington, DC (USA)). Sep 1981. Contract AC03-80CS24315. 15p. D. Order Number DE82008667.

A procedure for the determination of the bulk density of the burden in the trommel, under actual dynamical conditions of use is proposed. The problem is to arrive at a determination of the material bulk density as a function of the dynamic and geometric parameters of the device, and of the burden itself. The calculation method is presented. It is concluded from this investigation that in sizing the volume of a trommel required to process a given mass flow rate of a known feedstock, it is of paramount importance that dynamic bulk densities be used in the calculations. (MCW)

63205 **(DOE/CS/24315—T9) Elements of trommel dynamics: drag-free case.** Renard, M.L.; Clarke, G.V. (National Center for Resource Recovery, Inc., Washington, DC (USA)). Aug 1981. Contract AC03-80CS24315. 37p. D. Order Number DE82008666.

The approach and results of a previous study of the dynamics of an isolated particle in a trommel under no drag and with an indefinitely rough wall are examined analytically. The equations of motion and mass flow rate are analyzed. Calculations are made of the number of impingements necessary to achieve specified efficiencies for removal of undersize material raw MSW in a trommel. The procedure is then outlined for application to trommel design parameters. Limitations of the previous approach are outlined.

63206 **(DOE/CS/24315—T10) Elements of trommel dynamics: the effect of drag on particle motion.** Renard, M.L.; Clarke, G.V. (National Center for Resource Recovery, Inc., Washington, DC (USA)). Aug 1981. Contract AC03-80CS24315. 57p. D. Order Number DE82008506.

Predictions of dynamic behavior of individual particle trajectories in a trommel are calculated. Formulation of the problem is explained and the mathematical solution is followed. A number of numerical examples, thought to be typical (in size, shape, and density) of particles present in various fractions of raw or processed refuse, are treated to assess the effect of aerodynamic drag on the duration of the ballistic phase and on the location and geometry of particle impact onto the screen. Using the computer code FLIGHT, the time-of-flight ratios for a glass particle and a scrap of newsprint are graphically shown. The predictions of residence times and number of impingements are compared to those observed experimentally in laboratory scale experiments at upper Marlboro, Md. (MCW)

63207 **(ORNL/TM—8513) New district-heating system economic factors vary with different supply temperatures.** Borkowski, R.J.; Stovall, T.K.; Karnitz, M.A. (Oak Ridge National Lab., TN (USA)). Oct 1982. Contract W-7405-ENG-26. 22p. NTIS, PC A02/MF A01. Order Number DE83000422.

District heating has been in use for many years and offers economic, environmental, and energy conservation benefits. A new district heating system may be based on either a steam or hot water distribution system. The supply media choice is based upon the composition of the load and other factors. This report discusses the relative advantages of steam vs hot water systems and between hot water systems of varying temperatures. Points of comparison include: capital costs, cogeneration efficiencies, building conversion costs, operating and maintenance costs, energy losses, maximum transport distances, and cooling applications. The major conclusion is that a thorough analysis of the market, including building equipment and consumer requirements, is essential in designing a district heating system and is of primary importance in determining the optimum supply temperature.

3209 Education And Public Relations

REFER ALSO TO CITATION(S) 62788

63208 **(NP—2902386) Relation between science and living conditions in physical lessons - as exemplified by the subject of nuclear power plants.** Mikelskis, H. (Bremen Univ. (Germany, F.R.)). 1979. 301p. (In German). T. Order Number DE82902386.

Thesis.

After having explained the relevant characteristics of the fields of physics and living conditions the author investigates the relation between these two fields and its effects on school instruction as exemplified by the subject of nuclear power plants. Furthermore, he discusses the institutional, educational, and the didactic conditions for physics lessons at school. An exemplary field study on the practice of giving physics lessons based on the testing and evaluation of the didactic unit 'Energy supply by nuclear power plants' provides data the interpretation of which supports statements which had been described before theoretically.

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS

REFER ALSO TO CITATION(S) 63182

3301 Internal Combustion Engines

REFER ALSO TO CITATION(S) 62972, 62973

63209 **(DFVLR-MITT—81-27) Construction for the simulation of diesel-motor evaporation and combustion processes.** Baeumer, K.; Hartje, J.; Wanders, K.; Wiegand, H.; Mueller, J.; Schlundt, D. (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt e.V., Koeln (Germany, F.R.)). 1981. 57p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750614.

It is being described how to test the simulation of dieselmotor fuel-air mixing. A separate variation of the injection- and air-parameters is possible. The report includes the flow-mechanical design and a detailed description of the components of the construction. Furthermore is reported about the tests for the design of the injection-equipment. In addition to the measurement techniques the starting of the equipment is being discussed.

63210 (EPRI-RD—2369-SR, pp 2.29-2.52) **Fuel economy and the use of alternative fuels in medium- and slow-speed diesel engines.** Sarsten, A.; Fiskaa, G.; Valland, H. (Norwegian Inst. of Tech., Trondheim). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

The increasing fuel oil prices and the prospect of deteriorating heavy fuel quality for shipboard use are problems of some importance in Norway, a country whose large, diesel-engined merchant marine fleet contributes significantly to the national economy. This fact has led Norway to emphasize research into the possible effects of future fuels on marine diesel engines, and the increase in energy bill has led to research into diesel engine fuel economy and a ship's energy economy in general. The objective of this paper is to present some aspects of this research as regards medium and slow speed diesel engines. Information is included on diesel engine performance using heavy oils, solvent-refined coal liquids, and shale-derived diesel fuel and on engine modifications, i.e., surface treatments, fuel injection systems, that require further research. (LCL)

63211 (EPRI-RD—2369-SR, pp 2.53-2.71) **Diesel engine operational testing on early alternative fuels.** Fairbanks, J. (Dept. of Energy, Washington, DC); Gurney, D. May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

The alternative fuel industry in the US is in early stages of development, and the growth of this industry depends initially on verifying that coal liquids and shale oil are desirable fuels for industrial and utility diesel engines. US DOE programs for determining the performance of these fuels in low-, medium-, and high-speed diesel engines are reviewed. It has been demonstrated that a coal-derived liquid fuel can be processed to about petroleum diesel oil specifications, such as the COED fuel and it can be substituted as a fuel in the low-speed diesel. Also, oil shale can be refined to Marine Fuel Diesel (MFD) specifications to produce an excellent diesel fuel with a cetane number of 50. This fuel can be substituted directly for the petroleum MFD in medium-speed and high-speed diesels with no significant difference noted in performance or emissions. Engine durability with COED and shale oil MFD have not been demonstrated due to lack of large quantities of the fuels. However, a review of the characteristics of these fuels does not suggest any serious problems. (LCL)

63212 (EPRI-RD—2369-SR, pp 2.73-2.114) **Multifuel capability of modified diesel engines.** Kamo, R. (Cummins Engine Co., Inc., Columbus, IN); Nakagaki, T.; Yamada, T. May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

The open chamber, prechamber, and spark-assisted (prechamber) diesel engines with varying degrees of insulation were investigated for multifuel capability and emissions characteristics. The degree of engine insulation was achieved by operating the conventional water-cooled engine uncooled. Engine performance in terms of brake specific fuel consumption, rate of combustion pressure rise, and cold start was determined. Emissions measurements covered smoke, NOx, CO, UHC, and particulates. In general, the increasing degree of engine insulation improved the ability of the modified diesel to burn lower grade fuels such as coal-derived fuel oil, shale oil, and methanol without affecting engine performance and emissions. The spark-assisted diesel improved operating characteristics, especially for alcohol fuels. Cold start will be a problem for all the engines tested and an intake manifold burner may be necessary for the adiabatic case and the spark-assisted case. Increasing insulation to provide higher operating temperature offers best improvement for SRC-II combustion. In fact, the spark-assisted adiabatic diesel with intake heater for cold start may be the best combination for diesel multifuel capability.

63213 (EPRI-RD—2369-SR, pp 6.1-6.21) **Problems encountered in developing and using thermal barrier coatings on diesel engine components.** Kvernes, I. (Central Inst. for Industrial Research, Oslo, Norway). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

The use of poorer quality residual fuels in large diesel engines and gas turbines will become more common and will require special measures to reduce hot corrosion wear of engine parts. This report focuses on fuel oil contaminants, deposits and corrosion mechanisms mainly of coated exhausted valves in diesel engines, but also on coated guide vanes tested in small gas turbines. The goal of the work was to gain experiences from operating conditions in order to be able to obtain microstructure in the coating with superior properties. The engine tests are reported. Ash-forming materials and Na, Va, S, and Cl impurities are identified as the main fuel ingredients which cause wear and severe corrosion. Several valve seat materials were tested for hardness and corrosion resistance. The best results were obtained with Deloro Alloy 60 type alloy. Zirconia coatings were performance tested on exhaust valves. MgO-stabilized ZrO_2 was found to be the most stable coating compound in Va- and S-containing gases and that spraying of thin coatings (< 0,6 mm) of MgO-stabilized ZrO_2 after the CIIR specification creates a relatively low level of residual stresses. This type of coating seems to be acceptable on valves used in engines running on relatively clean fuels. The overall conclusion of this test program was that ceramic coatings seem to exhibit a larger corrosion problem than expected. A detailed understanding of the corrosion problems on ceramic is required. The correlation between powders, spray parameter and microstructure is relatively complex, and more information is needed. (LCL)

3303 Electric-powered Systems

REFER ALSO TO CITATION(S) 63090

3308 Alternative Fuels

REFER ALSO TO CITATION(S) 62570, 63211, 63212

36 MATERIALS

3601 Metals And Alloys

REFER ALSO TO CITATION(S) 62643, 62970, 62971, 62974, 62975, 62976, 62977, 62989, 62990, 62990, 62990, 62995, 63007, 63007, 63019, 63020, 63021, 63022, 63023, 63024, 63025, 63051, 63051, 63150, 63213, 63278, 63279

63214 **(BNL—31798) Small-angle elastic and inelastic neutron scattering in $Fe_{0.7}Al_{0.3}$.** Motoya, K.; Shapiro, S.M. (Brookhaven National Lab., Upton, NY (USA); Kyoto Univ. (Japan). Dept. of Metal Science and Technology). Aug 1982. Contract AC02-76CH00016. 5p. (CONF-820935—5). NTIS, PC A02/MF A01. Order Number DE83000265.

From 6. Yamada conference on neutron scattering of condensed matter; Tokyo, Japan (1 Sep 1982).

Portions of document are illegible.

63215 **(CONF-820935—4-Draft) Superconductivity and magnetism in ternary rare-earth compounds.** Mook, H.A.; Pringle, O.A.; Kawarazaki, S. (Oak Ridge National Lab., TN (USA); Argonne National Lab., IL (USA); California Univ., San Diego, La Jolla (USA)). Jul 1982. Contract W-7405-ENG-26. 17p. NTIS, PC A02/MF A01. Order Number DE82022263.

From 6. Yamada conference on neutron scattering of condensed matter; Tokyo, Japan (1 Sep 1982).

Superconductivity and magnetism are two types of order that can take place in materials at low temperatures. When the magnetic order is ferromagnetic, a competition exists between magnetism and superconductivity. Neutron scattering has been used to measure the interaction of magnetism and superconductivity in a series of ternary rare earth alloys. A wide range of behavior is found near the magnetic transition, including mean-field magnetic ordering, first-order transitions between magnetism and superconductivity, and co-existence of ferromagnetism and superconductivity with a sinusoidally-modulated magnetic phase.

63216 **(CONF-820952—1-Draft) Release of ion-implanted and transmutation-produced helium from nickel.** Poker, D.B.; Williams, J.M. (Oak Ridge National Lab., TN (USA)). Oct 1982. Contract W-7405-ENG-26. 24p. NTIS, PC A02/MF A01. Order Number DE82022266.

From International symposium on helium in metals; Juelich, F.R. Germany (21 Sep 1982).

Measurements of He release were performed on Ni samples doped by thermal neutron irradiation or ion implantation. Closed and open cylinders of Ni were neutron irradiated at 100°C. The amount of He released into the interior of the closed cylinders was equivalent to that produced in the volume of Ni within about 0.5 μm of the surface, indicating a significant mobility at room temperature. The open cylinders were heated in vacuum while the He release was measured. Below 1000°C, the amount of He released was equivalent to that produced within 0.02 μm of the surface. He release from Ni at temperatures between 18 and 600 K was measured after ion implantation of 35 KeV He^+ at 18 K. The only significant release was sharply peaked near 50 K.

63217 **(CONF-8009286—1-Draft) Adsorption and co-adsorption with CO of NO on Cu(110) studied with EELS and LEED.** Wendelken, J.F. (Oak Ridge National Lab., TN (USA)). Oct 1981. Contract W-7405-ENG-26. 17p. NTIS, PC A02/MF A01. Order Number DE82022272.

From International conference on vibrations at surfaces; Namur, Belgium (10 Sep 1980).

Portions of document are illegible.

The adsorption of NO on Cu(110) and its interaction with co-adsorbed CO at a crystal temperature of 80 K have been investigated with EELS. Dissociation of NO occurring at higher temperatures of higher exposures has been studied with both EELS and LEED. For exposures of less than 1.2 Langmuirs of ^{14}NO at a crystal temperature of 80 K, vibrational energies are initially observed at 106, 195, and 262 MeV with EELS. With increasing NO coverage, the first peak grows. However, both peaks vanish for exposures greater than 1.2 Langmuirs. If the crystal is heated above 113 K both peaks also vanish. The third peak, which represents the CO stretching vibration of less than 5% of a monolayer of CO, shifts upward in energy with increasing NO coverage but does not shift back when the first two peaks vanish. Hence, the NO or its products do not desorb under these conditions.

63218 **(DOE/ER/70026—T6) Grain-boundary sliding and deformation mechanisms during high-temperature creep. Final report.** Langdon, T.G. (University of Southern California, Los Angeles (USA). Dept. of Materials Science). Feb 1981. Contract AT03-76ER70026. 23p. NTIS, PC A02/MF A01. Order Number DE82020473.

Portions of document are illegible.

Information is presented concerning the influence of a fine dispersion of particles on creep and grain boundary sliding; the process of cavity nucleation and growth; grain boundary behavior in fatigue at high temperatures; creep behavior of Cu and Cu alloys; creep behavior of ceramic materials; creep fracture of Al and Al alloys; and deformation mechanism maps and creep fracture maps.

63219 **(DOE/PC/40794—2) Pneumatic erosion effects on microstructure of metals and alloys. Progress report, January 1, 1982-April 30, 1982.** Moteff, J. (Cincinnati Univ., OH (USA). Dept. of Materials Science and Metallurgical Engineering). 19 Jul 1982. Contract FG22-81PC40794. 18p. NTIS, PC A02/MF A01. Order Number DE82020976.

The effect of temperature on erosion resistance is little understood, partly on account of the superimposed effects of corrosion often encountered in air. Even so, a measured material property such as hot microhardness could provide some measure of erosion resistance at elevated temperatures in a fashion similar to the room temperature correlation. This phase of the program establishes microhardness as a function of temperature for AISI 304 stainless steel, Al 2024-T6 and the superalloy IN 718. For the first time, a correlation has been sought between hardness and erosion rate at temperatures above room temperature. Erosion rate data on the three materials at various temperatures, particle velocities and angles of impingement from 25° to 90° were provided by Dr. W. Tabakoff of the Department of Aerospace Engineering and Applied Mechanics, University of Cincinnati. The volume erosion rates normalized to a velocity of 183 m/s (600 f/s) showed an increased dependency on the microhardness, ϵ αH/sub v//sup -b/, where ϵ is the vol-erosion rate, H/sub v/ the microhardness and b a constant greater than 1.0 for IN 718 and 304 SS, and less than 1.0 for 2024 Al. Also, the velocity (v) dependence, ϵ αv/sup n/, showed a decreasing n (n < 20) with increasing temperature, more evident above about 0.5 T/sub M/ (T/sub M/ = melting temperature, °K). 6 figures, 2 tables.

63220 **(KFK—3247) Phase relationships, basic metallurgy and superconducting properties of Nb_3Sn and related compounds.** Fluekiger, R. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.)). Dec 1981. 12p. (CONF-8108123—2). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82750501.

From ICMC conference; San Diego, CA, USA (1 Aug 1981).

The phase relationships and the superconducting properties of Nb_3Sn are compared with those of other high Tsub(c) compounds crystallizing in the A15 structure: Nb_3Al, Nb_3Ga, Nb_3Ge, V_3Si, V_3Ga ... Characteristic differences of these systems, i.e., the shape of the A15 phase field, the variation of Tsub(c) with composition or with atomic ordering, are discussed. Recent methods leading to the accurate determination of the phase relationships in these systems up to 2000 °C are reviewed. The discussion is extended to the low temperature relationships in Nb_3Sn and V_3Si with the corresponding tetragonal modifications. Methods for observing these low temperature details and recent results about their influence on Tsub(c) are presented. In the case of Nb_3Sn, the factors influencing the formation of the low temperature tetragonal phase, such as hydrostatic pressure, precompression in multifilamentary wires, or hydrogen loading, are discussed.

63221 **(NE-M—2-21T-4-82) Forgings and bars for nuclear and other special applications (ASME SA-654 with additional requirements).** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). Apr 1982. 10p. Nuclear Standards Management Center, Oak Ridge, TN 37830.

This standard covers carbon steel and medium- and high-alloy steel forgings and bars for nuclear and associated applications.

63222 **(PNL—4341) What makes an electric welding arc perform its required function.** Correy, T.B. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1982. Contract AC06-76RL01830. 202p. NTIS, PC A10/MF A01. Order Number DE83000542.

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The physics of direct current and alternating current welding arcs, the heat transfer of direct current welding arcs, the characteristics of dc welding and ac welding power supplies and recommendations for the procurement and maintenance of precision power supplies are discussed. (LCL)

63223 **(SAND—81-1014) Metallographic techniques and microstructures: uranium alloys.** Romig, A.D. Jr. (Sandia National Labs., Albuquerque, NM (USA)). Aug 1982. Contract AC04-76DP00789. 85p. NTIS, PC A05/MF A01. Order Number DE82022230.

Portions of document are illegible.

The techniques used for the metallographic analysis of uranium and its alloys are discussed. Sample preparation and characterization procedures are described for: optical metallography, scanning electron microscopy, electron microprobe analysis, transmission electron microscopy, and scanning transmission electron microscopy. A brief overview of electron optics, electron/sample interactions, signal detectors, and x-ray microanalysis is presented. Typical uranium alloy microstructures observed by these techniques are presented and discussed. The microstructures examined include those produced by the diffusional decomposition of γ:U-0.75Ti and γ:U-6Nb, the martensitic decomposition of U-2Mo, U-6Nb, U-0.75Ti and Mulberry, and the aging of quenched U-2Mo.

63224 **(SAND—82-1188C) Behavior of sustained high-current arcs on molten-alloy electrodes during vacuum consumable-arc remelting.** Zanner, F.J.; Bertram, L.A. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 14p. (CONF-821024—5). NTIS, PC A02/MF A01. Order Number DE82021251.

From 10. international symposium on discharges and electrical insulation in vacuum; Columbia, SC, USA (25 Oct 1982).

Portions of document are illegible.

Vacuum consumable arc remelting is a casting process carried out in a vacuum with the aim of remelting the consumable electrode in such a way that the new ingot has improved chemical and physical homogeneity. The power which causes the melting is supplied by a vacuum arc burning between the electrodes. In order to determine the furnace partitions of electrical power and current, experiments were conducted on molten-faced round electrodes. The quasi-steady melt rate was determined for both horizontally opposed 15-cm-dia. Ni electrodes and for vertically suspended 40-cm-dia. Inconel 718 electrodes.

63225 (ZfI-Mitt—39, pp 79-107) **Tracer techniques in microelectronics.** Flachowsky, J.; Freyer, K. Jun 1981. (In German). Dep. NTIS (US Sales Only).

From KDT meeting on isotopes for rationalization in industry; Leipzig, German Democratic Republic (4 Jun 1980).

Tracer technique and neutron activation analysis are capable of measuring impurities in semiconductor material or on the semiconductor surface in a very low concentration range. The methods, combined with autoradiography, are also suitable to determine dopant distributions in silicon. However, both techniques suffer from certain inherent experimental difficulties and/or limitations which are discussed. Methods of tracer technique practicable in the semiconductor field are described.

63226 **Comparison of simulated and experimental displacement cascade dimensions in Cu_3Au.** Heinisch, H.L. (Hanford Engineering Development Lab., Richland, WA (USA)). *Philosophical Magazine, [Part] A: Defects and Mechanical Properties;* **45**: No. 6, 1085-1088(Jun 1982).

The maximum transverse dimensions of computer-simulated displacement cascades in ordered Cu_3Au are compared with the maximum dimensions of disordered zones imaged in transmission-electron-microscope superlattice reflections. Good agreement between the theoretical and experimental cascade dimensions is obtained only when the very small foil thicknesses necessary for the experimental technique are accounted for in the simulations. Because the cascades are much longer than the foil thicknesses for energies above 50 keV, the usefulness of this experimental technique may be limited to lower energies.

63227 **Oxygen embrittlement of Zircaloy-2 on long-term exposure to alkaline earth and rare earth oxides.** Kohli, R. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.; California Univ., Berkeley (USA). Dept. of Nuclear Engineering). *Journal of Materials Science Letters;* **1**: No. 4, 141-144(Apr 1982).

The purpose of this paper is to present some results of slow strain rate tensile tests in Zircaloy-2 specimens after long-term exposure to SrO, BaO, CeO_2, La_2O_3, Gd_2O_3 and Y_2O_3. The degree of embrittlement was determined by comparing the results of annealing in the oxides with those on identical specimens annealed in high-purity argon, in terms of the fracture morphology and of variation of the tensile properties with the annealing parameters. Even at the low annealing temperature of 623 K the specimens were severely embrittled, irrespective of the oxide environment, although annealing times longer than 1000 to 1500 h were needed for embrittlement to occur. The specimens broke with a reduction of area of less than 5%, as compared with over 75% for the samples annealed in the argon environment. The results are given and discussed.

63228 **Sputtering yield calculations for neutral beam particle energies.** Haggmark, L.G. (Sandia National Labs., Albuquerque, NM (USA)); Biersack, J.P. (Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.)). *Journal of Nuclear Materials;* **103**: No. 1-3, 345-350(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Sputtering yield calculations have been performed for 50, 100, and 200 keV D incident on Fe, Mo, and W at both normal and oblique angles of incidence. The calculations were performed with an extension of the TRIM Monte Carlo computer program. The calculated yields at these high energies decrease with the incident energy approximately as the high energy, nuclear stopping power for both normal and oblique incident angles. The increases in the yield as a function of the incident angle α relative to yield at normal incidence ($\alpha = 0^\circ$) are quite large and cannot be represented by a simple cossup(-f)α dependence, where f is a constant. These relative increases as a function of angle are found to be very similar for the three materials considered in this study.

63229 **Exposure and temperature dependence of elongated blister formation in complex radiation environments.** McDonell, W.R. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). *Journal of Nuclear Materials;* **103**: No. 1-3, 387-392(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Blistering of platinum alloy surfaces by ^{252}Cf alpha particle and fission fragment radiations occurred at relatively low concentrations of implanted helium during exposures at 1000°C as well as at room temperature. Distinctive configurations of the blisters, resulting from transport of atoms displaced by the fission fragments, persisted during the high temperature exposures. Post-exposure heating of specimens exposed at room temperature produced no additional blistering until temperatures of 1300°C were reached. Post-exposure heating of specimens blistered at 1000°C produced only thermal etching effects. The low helium concentrations required for blistering and the distinctive blister configurations produced by ^{252}Cf exposures suggest a unique mode of surface distortion resulting from the large number and highly localized distributions of atom displacements generated by ^{252}Cf fission fragments. Such conditions may not be duplicated in the He-ion and fast neutron radiation environments of fusion reactors.

63230 **Suppression of repetitive surface exfoliation of Inconel 625 implanted sequentially with helium ions of different energies (20-100 keV).** Rao, A.S.; Whitton, J.L.; Kaminsky, M. (Argonne National Lab., IL (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 397-402(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Studies were conducted to explore if the surface exfoliation of Inconel 625, typical for 100 keV $^4He^+$ irradiations can be reduced by pre-irradiating the surfaces with helium ions sequentially over the energy range 20 to 50 keV. Polished, polycrystalline Inconel 625 samples were irradiated at 298 K and 573 K with $^4He^+$ at six different energies in the range from 20 to 50 keV in an order of decreasing energies. For each energy the dose was 0.13 C/cm², resulting in a total dose of 0.89 C/cm². Subsequently, these samples were implanted with 100 keV $^4He^+$ to a dose of 1.0 C/cm² or 2.0 C/cm². The results reveal that the low energy $^4He^+$ implants prior to the 100 keV $^4He^+$ implant reduce significantly the erosion yield

typical for 100-keV $^4He^+$ irradiations alone. For 573 K these reduced yields are still about one order of magnitude greater than physical sputtering yields.

63231 **Modifications of subsurface alloy composition during high-temperature sputtering.** Lam, N.Q.; Wiedersich, H. (Argonne National Lab., IL (USA). Materials Science Div.). *Journal of Nuclear Materials;* **103**: No. 1-3, 433-438(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Changes in the subsurface composition of concentrated binary alloys during high-temperature sputtering were studied using a kinetic model that includes Gibbsian adsorption, preferential sputtering, displacement mixing, radiation-enhanced diffusion, and radiation-induced segregation. Numerical solutions were obtained for Cu-Ni alloys under 5-keV Ar^+ ion bombardment as functions of sputtering time and temperature. The effects of these various phenomena were examined in detail. The present calculations may be of importance in the areas of plasma contamination in fusion reactors, sputter depth-profiling, and elevated-temperature ion implantation.

63232 **Surface modification of 300 series stainless steel by a deuterium plasma.** Kerst, R.A. (Sandia National Labs., Albuquerque, NM (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 439-444(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

Samples of 300 series stainless steel (SS) and Mo have been exposed to 300 eV and 20 eV D^+_3 ions from a deuterium plasma with fluxes up to 1.7 x 10^{17} D x $cm^{-2}s^{-1}$. The exposed surfaces were examined by scanning and transmission electron microscopy. Although the highest fluxes produced evidence of erosion, no blisters were seen. The same exposure given to Mo, however, produced extensive blistering. The experimental results are compared with theoretical computations of hydrogen transport in SS and interpreted in the context of a model for hydrogen blistering.

63233 **Temperature dependence of H saturation and isotope exchange.** Doyle, B.L.; Wampler, W.R.; Brice, D.K. (Sandia National Labs., Albuquerque, NM (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 513-518(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

The retention, release, and isotope exchange of ion implanted hydrogen and deuterium in carbon and TiC have been investigated as a function of temperature. The implantations were performed both at room and elevated temperatures. In addition, samples implanted at room temperature were annealed isochronally to measure the thermal release of hydrogen. The results of the experiments indicate that both the saturation and isotopic exchange properties of hydrogen are dependent on both temperature and damage producing processes.

63234 **Corrosion of type 316 stainless steel in Molten LiF-LiCl-LiBr.** Tortorelli, P.F.; DeVan, J.H.; Keiser, J.R. (Oak Ridge National Lab., TN (USA). Metals and Ceramics Div.). *Journal of Nuclear Materials;* **103**: No. 1-3, 675-680(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

The properties of LiF-LiCl-LiBr salt make it attractive as a solvent for extracting tritium from a fusion reactor lithium blanket. Consequently, the corrosion of type 316 stainless steel by flowing (about 15 mm/s) LiF-LiCl-LiBr at a maximum temperature of 535°C was studied to determine whether compatibility with the structural material would be limiting in such a system. The corrosion rate was found to be low (< 2 μm/year) except immediately after the addition of a small amount of lithium metal to the salt. The lithium addition increased the corrosion rate to 13.5 μ/year at 535°C (approximately that of type 316 stainless steel exposed to lithium flowing at a similar velocity). At the proposed operating temperature (<= approx. equal to 535°C), however, it appears that type 316 stainless steel has acceptable compatibility with the tritium-processing salt LiF-LiCl-LiBr for use with a lithium blanket.

63235 **A comparison of gaseous hydrogen embrittlement, slow-strain-rate hydrogen embrittlement, and stress-corrosion cracking in Ti-8Al-1Mo-1V.** Koch, G.H.; Bursle, A.J.; Liu, R.; Pugh, E.N. (Univ. of Illinois, Urbana). *Metallurgical Transactions, [Section] A: Physical Metallurgy and Materials Science;* **12A**: 1833-1843(Oct 1981). Contract AC02-76ER01198.

Metallographic, fractographic, and acoustic-emission studies have been carried out on the near-α commercial alloy, heat treated to produce the Widmanstatten structure and in some cases aged to precipitate α_2. Both aged and unaged material underwent gaseous hydrogen embrittlement (GHE) in ~ 10kPa gaseous hydrogen, failure occurring along the α-β interface. Electron-diffraction studies established the presence of a layer of fcc titanium hydride at the fracture surfaces, and acoustic-emission and fractographic observations indicated that propagation was discontinuous. The aged alloy underwent slow-strain-rate hydrogen embrittlement in inert environments and stress-corrosion cracking in 3 pct aqueous NaCl and, in contrast to CHE, failure occurred across the α-plates in both cases, producing indistinguishable cleavage-like fracture surfaces. Again, titanium hydride was detected at the fracture surfaces and, from acoustic-emission studies, crack propagation appeared to be discontinuous. Based on these observations, it is suggested that the three forms of failure occur by a common mechanism namely by the repeated formation and rupture of the hydride phase.

63236 **Stress corrosion cracking of Alloy 600 using the constant strain rate test.** Bulischeck, T.S.; Van Rooyen, D. (Brookhaven National Lab., Upton, NY). *Corrosion (Houston);* **37**: No. 10, 597-607(Oct 1981).

From Corrosion/80; Chicago, IL, USA (Mar 1980).

Nuclear grade production tubing of Alloy 600 was evaluated for stress corrosion cracking (SCC) susceptibility in high purity water at 365, 345, 325, and 290 C. Reverse tube U-bend specimens provided crack initiation data and constant extension rate tests were employed to determine the crack velocities experienced in th crack propagation stage. Initial results indicate that a linear extrapolation of data received from high temperature tests can be used to predict the service life of steam generator tubing that has been plastically deformed or is continually deforming by "denting."

63237 **Effect of Selenium on GTAW Fusion Zone Geometry.** Heiple, C.R.; Roper, J.R. (Rockwell International, Golden, CO). *Welding Research (Miami);* vp(Aug 1981). Contract AC04-76DP03533.

Small additions of selenium to 21-6-9 stainless steel dramatically increase the depth/width ratio of bead-on-plate welds. The depth/width ratio increased by over 160% with the addition of 140 ppm selenium to the base metal. The change depth/width ratio is consistent with, and was predicted by, a model for control of weld fusion zone geometry by fluid flow in the weld pool driven by surface tension gradients on the weld pool.

63238 **Use of instrumented Charpy tests to determine onset of upper-shelf energy.** Canonico, D.A.; Stelzman, W.J., Berggren, R.G.; Nanstad, R.K. (Oak Ridge National Lab., TN). *Welding Research (Miami);* 85s-91s(May 1981).

Identifying the onset of C/sub v/ upper-shelf toughness is of paramount importance to the continued integrity of a pressure vessel. Most in-service surveillance programs require that the C/sub v/ upper-shelf toughness be determined. This is particularly true for the surveillance programs for nuclear pressure vessels. In the nuclear systems the change in C/sub v/ upper-shelf energy due to irradiation must frequently be determined with a limited number of surveillance specimens. Currently, fracture appearance is the criterion used to assure that the tests are being conducted in the C/sub v/ upper-shelf temperature range. This procedure is satisfactory when a number of specimens are available and accessible for interpretation. This is not always the case; irradiated specimens must be remotely tested and interpreted. Examining a specimen remotely may result in an erroneous interpretation of the fracture surface. To avoid this possibility we have developed a procedure, using an instrumented Charpy impact tester, that by linear extrapolation can identify the onset of the C/sub v/ upper-shelf toughness regime

with as few as two specimens. This paper discusses the development of the procedure and its application.

63239 **Brazing of sensors for high-temperature steam instrumentation systems.** Moorhead, A.J.; Morgan, C.S.; Woodhouse, J.J.; Reed, R.W. (Oak Ridge National Lab, TN). *Welding Journal (Miami);* 17-28(Apr 1981).

From 11th Intl. AWS-WRC Brazing Conf.; Los Angeles, CA, USA (15 Apr 1980).

Procedures are developed for brazing a ceramic-to-metal seal and for laser welding of sensor subassemblies into tube walls, induction brazing thermocouples through a tube wall, and furnace brazing triaxial cables, thermocouples, and a vent tube to a guide tube.

63240 **Computer simulation of a "tweed-transformation" in an idealized elastic crystal.** Wen, S.H. (IBM, Yorktown Heights, NY); Khatchaturyan, A.G.; Morris, J.W. Jr. *Metallurgical Transactions, [Section] A: Physical Metallurgy and Materials Science;* 12A: 581-587(Apr 1981). Contract W-7405-ENG-48.

From Metalurgical Society of AIME Ann. Mtg.; New Orleans, LA, USA (18 Feb 1979).

A tweed-like transformation in a simple two-dimensional solid is simulated by distributing coherent rectangular particles over a square lattice and permitting them to undergo a step-wise reconfiguration so as to decrease the elasic energy. The equations determining the elastic energy of an arbitrary distribution of coherent tetragonal precipitates in a cubic crystal are developed under the assumptions that the precipitates are coherent, that the elastic constants are uniform, and that linear elastic relations apply; these include the example of rectangular precipitates in a square lattice as a special case. The model system is shown to relax into a tweed-like configuration in which like-variant particles align along (11) lines. The relaxed configuration yields simulated diffraction patterns and bright-field electron images which strongly resemble those obtained experimentally from the "tweed" transformation in Cu-Be.

63241 **Microstructures developed in austenitic stainless steels irradiated in HFIR at 552°C.** Maziasz, P.J. (ORNL, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* 39: 433-435(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63242 **Tensile properites of irradiated 9 Cr-1 Mo-V-Nb type steels containing (n,α) helium.** Grossbeck, M.L.; Klueh, R.L.; Vitek, J.M. (ORNL, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* 39: 440-442(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63243 **Structures of four fast-ion conductors by single-crystal neutron-diffraction analysis: Zn-stabilized Naβ″ -alumina and Mg-stabilized Na-, K-, and Agβ″-aluminas.** Brown, G.M.; Schwinn, D.A.; Bates, J.B.; Brundage, W.E. (Oak Ridge National Lab., TN). *Solid State Ionics;* 5: 147-150(1981). Contract W-7405-ENG-26.

The crystal samples used were from the same batches as those used in other physical studies at Oak Ridge. Precise cell parameters were determined. The Zn^{2+} ion substitutes only in the A1(2) sites, as does Mg^{2+}. The degree of substitution by Zn^{2+} (28.5% from chemical analysis and 29.3% from diffraction analysis) is less than that by Mg^{2+} (33.5% from chemical analysis and 34.9% for the average diffraction result from the three Mg-stabilized β″ -aluminas). This implies more Na^+ vacancies in Zn-stabilized Naβ-alumina and may explain why it has a higher room-temperature conductivity than Mg-stabilized β″-alumina. Fourier maps of the conducting-ion distributions are presented. The 0(5) ions were treated as disordered in refinement of Mg-stabilized Ag- and Naβ″-aluminas.

63244 **Defects and disorder in the fast-ion electrode lithium-aluminum.** Susman, S.; Brun, T.O. (Argonne National Lab., IL). *Solid State Ionics;* 5: 413-416(1981).

Neutron and X-ray diffraction measurements indicate no phase change in β-phase LiAl from 300 to 940 K. The thermal expansion of the lattice constant and the temperature dependence of the Debye-Waller factor Li are linear and not unusually large. The data are analyzed in the Bragg-Williams approximation with T/sub c/ = 1100 K. At elevated temperatures, LiAl approaches an order-disorder transformation. At battery operating temperatures (700 K) there are appreciable concentrations of both types of antisite defects Li/sub Al/ and Al/sub Li/, and there is appreciable Al diffusion.

63245 **A NMR relaxation study of lithium motion in superionic Li/sub x/Al/sub 1-x/ with x = 0.49, 0.50 and 0.51.** Tokuhiro, T.; Susman, S. (Argonne National Lab., IL). *Solid State Ionics;* 5: 421-424(1981).

The temperature dependence of the ^7Li spin-lattice relaxation time (t_1) measured at 7 and 4.3 MHz in Li/sub x/Al/sub 1-x/ reveals that: (1) the T_1 behavior depends strongly on the composition; (2) the T_1 minimum at low temperatures has a double minimum structure; and (3) a third T_1 minimum appears at high temperatures. The deconvolution of the temperature dependence of $1/t_1$ has led to the following conclusion: the ^7Li motion arising from vacancies loosely bound to the antisite Li/sub Al/ defect is independent of composition below 50.7 atom% Li. The diffusion of ^7Li arising from the motion of free vacancies increases below 50.7 atom% Li with increasing free V/sub Li/ concentration.

63246 **The structure and interdiffusional degradation of aluminide coatings on oxide-dispersion-strengthened alloys.** Boone, D.H.; Crane, D.A.; Whittle, D.P. (Lawrence Berkeley Lab., CA). *Thin Solid Films;* vp(1981).

From International Conf. on Metallurgical Coatings; San Francisco, CA, USA (6 Apr 1981).

A study of the effects of the composition and coating processing of oxide-dispersion-strengthened superalloys on the structure and diffusional stability of aluminide coatings was undertaken. Increasing the aluminum content of the substrate resulted in the formation of a more typical nickel-base superalloy aluminide coating structure that is more resistant to spallation during high temperature isothermal exposure. The coating application process also affected the coating stability; a low aluminum outward diffusion type resulted in greater apparent stability. A scanning electron microscopy deep etching and fractography examination technique was used in an attempt to establish the location and kinetics of void formation. Aluminide protective lifetimes are still found to be far short of the mechanical property capabilities of the alloy.

63247 **Composition, ion-ion correlations and conductivity of beta″-alumina.** Bates, J.B.; Engstrom, H.; Wang, J.C.; Larson, B.C.; Dudney, N.J.; Brundage, W.E. (Oak Ridge National Lab., TN). *Solid State Ionics;* 5: 159-162(1981). Contract W-7405-ENG-26.

It is concluded from conductivity and diffuse x-ray scattering measurements on Mg stabilized Na and K β″-alumina single crystals that higher activation energies are associated with greater ordering of mobile ions on a superlattice. Similar measurements on Zn stabilized Naβ″ with a higher vacancy concentration suggest that the low temperature conductivity is mainly determined by the fraction of vacancies that are not ordered. The rapid decrease observed in the Raman intensity of the 144 cm^{-1} Na^+ mode with increasing temperature is attributed to fluctuations caused by thermal excitation of the low energy mode at 32 cm^{-1}.

63248 **Effect of hydration on conduction ion correlations in Na β″-alumina.** Larson, B.C.; Bates, J.B.; Dudney, N.J.; Barhorst, J.F. (Oak Ridge National Lab., TN). *Solid State Ionics;* vp(1981). Contract W-7405-ENG-26.

In this study, we have used the lineshapes of x-ray superlattice diffraction streaks to investigate the effect of water on Na^+ ion correlations in Mg and Zn stabilized Na β″-alumina. Water was found to reduce superlattice correlations as evidenced by lower x-ray superlattice streak intensities and broader linewidths. Correlation lengths for dry Mg and Zn stabilized crystals were found to be 66 and 56 angstrom, respectively, while the corresponding values found to be 32 and 22 angstrom for water concentrations of ~0.2 molecules per planar unit cell. These results emphasize the need to ensure that Na β″-alumina crystals are free of water before using them in experimental investigations.

63249 Conduction plane and structure of Li-stabilized Na^+ β''-alumina: a powder neutron diffraction study. Jorgensen, J.D. (Argonne National Lab., IL); Rotella, F.J.; Roth, W.L. *Solid State Ionics;* **5**: 143-146(1981).

The structure of Li-stabilized Na^+ β''-alumina has been refined by Rietveld analysis of high resolution time-of-flight powder diffraction data. The sample was a sintered tube of the type used for battery separators. The Li was found to reside in the Al(2) site in the spinel block. Fourier mapping and Rietveld analysis revealed that Na is located in both 6c and 18h sites (hexagonal setting of space group R3m) separated 1.03(3) angatrom in the conduction slab.

63250 Neutron-powder-diffraction study of defect spinel structures: tetrahedrally coordinated Ti^{4+} in Ni/sub 2.62/Ti/sub 0.69/O_4 and Ni/sub 2.42/Ti/sub 0.74/Si/sub 0.05/0_4. Lager, G.A. (Univ. of Louisville, KY); Armbruster, T.; Ross, F.K.; Rotella, F.J.; Jorgensen, J.D. *Journal of Applied Crystallography;* **14**: 261-264(1981).

Cation-excess spinels with the general formula $Ni^{2+}{}_3$/(sub 1 + x)/(Si^{4+})/(sub 1 - x)/O_4 ($0.16 \leqq X \leqq 1$) can be considered as defect NiO rocksalt structures in which two octahedral metal atoms are replaced by one tetrahedrally coordinated atom. Neutron time-of-flight powder data have been collected for two members of the solid-solution series with the ZING-P' high-resolution diffractomerter at Argonne National Laboratory. Least-squares refinement, using a modified Rietveld profile analysis, confirms that all Ti^{4+} in $Ni_{3\ 68}Ti_{0\ 68}O_4$ and $Ni_{2\ 43}Ti_{0\ 74}Si_{0\ 08}O_4$ partially occupies the tetrahedral site 8(a) (Fd3m). Ni^{2+} totally occupies the octahedral position 16(d) and partially occupies position 16(c) which is vacant in stoichiometric spinels. The presence of small amounts of Si^{4+} (~ 3 mol%) in the tetrahedral site 8(a) stabilizes the structure and results in a large decrease in the a cell parameter.

63251 Columnar grain structure in thick sputtered nickel. Patten, J.W. (Pacific Northwest Lab., Richland, WA). *Thin Solid Films;* **75**: 205-211(1981). Contract AC06-76RL01830.

The same two types of columnar growth structures were observed in sputtered nickel as have been observed in sputtered chromium. Transmission electron microscopy showed that columnar boundaries oriented perpendicular to the substrate surface were actually grain boundaries originating from rotational mismatch between adjacent grains about a common axis ([110] Ni direction) perpendicular to the substrate surface. No porosity or reduced density was observed in these columnar grain boundaries or in an interface 100-200 angstrom thick that was produced by an interruption in the sputter deposition experiment.

63252 Enthalpies and temperatures of transformation for plutonium using a differential scanning calorimeter. Rolon, C.E.; Gallegos, G.F. (Univ. of California, Livermore). *Journal of Thermal Analysis;* **21**: 159-161(1981). Contract W-7405-ENG-48.

The enthalpies and temperatures of transformation of high purity plutonium were measured using a differential scanning calorimeter. The results of our study are presented and compared to values obtained by previous methods.

63253 Wetting and spreading in the Cu-Ag system. Sharps, P.R.; Tomsia, A.P.; Pask, J.A. (Lawrence Berkeley Lab., CA). *Acta Metallurgica;* **29**: 855-865(1981). Contract W-7405-ENG-48.

Sessile drop experiments were made in the copper-silver system at the eutectic temperature and 900°C. Wetting, or acute contact angles, were observed for specimens in chemical thermodynamic equilibrium. Spreading occurred when the substrate was not in chemical equilibrium with the liquid. The interface does not remain aligned with the free surface of the substrate only in the presence of reactions.

63254 Growth and characterization of heteroepitaxial zinc selenide. Besomi, P.; Wessels, B.W. (Northwestern Univ., Evanston, IL). *Journal of Crystal Growth;* **55**: 477-484(1981). Contract AC02-79ER10390.

ZnSe has been heteroepitaxially deposited on GaAs substrates by vapor transport using hydrogen in an open tube reactor. A quasi-equilibrium model explains quantitatively the source transport reaction over the temperature range studied. It is shown that the substrate surface processes limit the growth rate in the deposition region. The activation energy for the surface reaction is 26 kcal/mole. Capacitance-voltage measurements on ZnSe/GaAs heterojunctions indicated that the layers are homogeneously doped and an abrupt heterojunction is observed.

63255 The influence of alloying elements on oxygen diffusion and flexure in tantalum base alloys. Pawel, R.E.; Campbell, J.J. (Oak Ridge National Lab., TN). *Acta Metallurgica;* **29**: 809-817(1981). Contract W-7405-ENG-26.

Experiments were conducted in which the flexure of specimens of tantalum and tantalum base alloys exposed on one side to oxygen at low pressures was examined with regard to oxygen diffusion and oxygen solution effects. Diffusion coefficients for oxygen in Ta, Ta-10% W, and Ta-10% W-2.5% Hf (T-222) were calculated from the flexure measurements on the basis of simple strain-diffusion models. The results indicated that both tungsten and hafnium influence oxygen diffusion in tantalum and that for the case of the hafnium-containing alloy, a model with hafnium serving as a saturable trap for oxygen is consistent with the observations.

63256 Observations on the differences reported in region I for the superplastic Zn-22% Al eutectoid. Grivas, D. (Lawrence Berkeley Lab., CA); Morris, J.W. Jr.; Langdon, T.G. *Scripta Metallurgica;* **15**: 229-236(1981). Contract W-7405-ENG-48.

This paper discusses the different types of creep behavior reported for the steady-state deformation of the superplastic Zn-22% Al eutectoid alloy at low stress levels. All existing theories of creep behavior predict that at sufficiently low stresses the steady-state creep will be diffusion-controlled and will follow a power-law with a strain rate exponent of $m = 1.0$. The question is whether this diffusional creep mechanism sets the lower bound on superplastic deformation in typical samples of Zn-22% Al, or whether another type of creep behavior intervenes.

63257 Cracking of SiO_2 layers on annealed InP. Oberstar, J.D.; Streetman, B.G.; Sammann, E.A. (Univ. of Illinois at Urbana-Champaign). *Thin Solid Films;* **81**: 347-356(1981). Contract AC02-76ER01198.

Cracking in chemically vapor-deposited SiO_2 encapsulating layers on InP when these samples were annealed at temperatures above 650°C was observed using optical microscopy, scanning electron microscopy, and Auger electron spectroscopy. The detailed nature of this form of film failure was studied. Thermally induced stress betwen the film and the InP does not fully account for the phenomena reported here. The observed cracking apparently results from an interaction between mechanical stress, chemical effects and possibly defects in the SiO_2 layers.

63258 Applications of the theory of cavity growth to dual-ion swelling experiments. Hayns, M.R.; Mansur, L.K. (Oak Ridge National Lab., TN). *American Society for Testing and Materials, Special Technical Publication;* **725**: 213-230(1981).

The rate theory of cavity growth is applied to study the effects of helium gas on cavity swelling. The variation of swelling with temperature is emphasized. (1) Expressions are derived showing that the primary effect of the helium is in pressurizing cavities and that a secondary effect is in altering the microstructural sink strengths. (2) Recent experimental data on swelling of a pure stainless steel-type alloy under dual-nickel and helium-ion bombardment are interpreted. Helium-free, helium-coimplanted, and helium-preimplanted swelling results can be explained by the theory. It is necessary to account for the partitioning of the helium to dislocations as well as to cavities in order to explain the experimental results for helium coimplantation. (3) Model studies for physically reasonable parameters reveal the importance of the helium/displacements per atom ratio.

63259 **Scanning reference electrode techniques in localized corrosion.** Isaacs, H.S.; Vyas, B. (Brookhaven National Lab., Upton, NY). *American Society for Testing and Materials, Special Technical Publication;* **727**: 3-33(1981).

The principles, advantages, and implementations of scanning reference electrode techniques are reviewed. The technique locates the position of localized corrosion, and can be used to monitor the development of corrosion and changes in the corrosion rate under a wide range of conditions. Data related to pitting, intergranular corrosion, welds, and stress-corrosion cracking are presented.

3602 Ceramics, Cermets, And Refractories

REFER ALSO TO CITATION(S) 62572, 62586, 62744, 62972, 62978, 62979, 62980, 62981, 62981, 62982, 62983, 62984, 62985, 62985, 63091, 63213, 63218, 63233

63260 **(SAND—82-1152C) Erosion behavior of CVD TiB_2 coatings on TiB_2-based ceramic substrates in high-velocity coal-oil slurries.** Finch, C.B.; Tennery, V.J.; Curlee, R.M. (Oak Ridge National Lab., TN (USA); Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 15p. (CONF-821109—1). NTIS, PC A02/MF A01. Order Number DE82018300.

From International conference on recent developments in specialty steels and hard materials; Pretoria, South Africa (8 Nov 1982).

Portions of document are illegible.

The erosion behavior of chemically vapor deposited (CVD) TiB_2 coatings deposited on hot pressed TiB_2 ceramic substrates was studied by impingement of a liquid stream containing 8 wt % of coal derived solids (SRC-1/sup a/) in anthracene oil upon the CVD surface, and compared with erosion of a high-density uncoated TiB_2 ceramic specimen. Erosive exposure of all specimens was conducted at ~ 350°C for 1 h at a liquid flow velocity of 100 m/s and an incidence angle of 20° between the liquid jet and the specimen surfaces. These conditions simulate those present in pressure letdown valves in direct coal liquefaction processes. The principal materials variables included the microstructure and composition of the TiB_2 ceramic substrates, while the CVD coatings were all deposited under identical conditions at 900°C from the hydrogen reduction of $TiCl_4$ and BCl_3. The deposited CVD coatings, which were ~ 50 μm in thickness, exhibited strong preferred orientation as determined by x-ray diffraction. Relative erosion resistance was assessed by determining the maximum depth of the erosion crater formed in the TiB_2 surface at the point of jet impingement. For the four CVD coatings exposed, the maximum crater depth values were 0, 1.5, 5.5, and 5.5 μm, while the uncoated specimen had a depth of ~ 22 μm. Prior work had shown that only consolidated or single-crystal diamond provided zero crater depths under these conditions. The outstanding erosion resistance of the CVD coatings was apparently related to their crystallographic texture.

63261 **Sputtering and surface modification of TiC coatings by low energy deuterium bombardment.** Borders, J.A.; Nelson, G.C. (Sandia National Labs., Albuquerque, NM (USA)). *Journal of Nuclear Materials;* **103**: No. 1-3, 369-372(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

The sputter yield of TiC films subjected to low energy (0.4-10.0 keV) deuterium bombardment has been measured using a weight loss technique. Very good agreement is obtained with previous data. The 2.0 keV deuterium sputter yield of the TiC films was measured from 23C to 700C and no significant change was observed. Surface spectroscopic measurements made following high fluence (10^{20}-10^{21} cm^{-2}) deuterium bombardment at 2.0 keV show that there is no appreciable modification of the surface stoichiometry and thus no preferential sputtering.

63262 **Energy of <001> coincidence twist boundaries in oxides with NaCl structure.** Wolf, D.; Benedek, R. (Argonne National Lab., IL). pp 107-113 of Advances in ceramics, volume 1, grain boundary phenomena in electric ceramics. Columbus, OH; American Ceramic Society (1981).

The energies of <001> coincidence twist boundaries in MgO and NiO were calculated using empirical interatomic potentials that had proven useful in earlier point-defect and surface energy calculations. Stable boundaries were found for all values of the inverse coincidence site density, Σ, between 5 and 73. Neither the unrelaxed nor the relaxed energy seems to scale with Σ, however. While the unrelaxed energies are found to be practically independent Σ, the relaxed energies appear to scale with the misfit angle Θ. Our results are compared with earlier calculations by other investigators for Ni and Cu.

63263 **Intercalation of water into lithium β-alumina.** Dudney, N.J.; Bates, J.B.; Wang, J.C.; Brown, G.M.; Larson, B.C.; Engstrom, H. (Oak Ridge National Lab., TN). *Solid State Ionics;* **5**: 225-228(1981). Contract W-7405-ENG-26.

Infrared absorption, neutron diffraction and weight loss techniques have been used to investigate the hydration of single crystals of Li β-alumina.The hydration is a reversible intercalation reaction. Up to approximately two water molecules per formula unit can penetrate the conduction plane. Other protonated species are formed from the dissociation of the molecular water. The rate of hydration is controlled by the diffusion of water in the conduction plane. A likely diffusion mechanism requires dissociation of the water and an interstitialcy motion of the oxygen.

63264 **The congruently vaporizing compositions and thermodynamic properties of the cubic phase of substoichiometric zirconium dioxide.** Rauh, E.G.; Garg, S.P. (Argonne National Lab., IL). *High Temperature Science;* **14**: 121-134(1981).

The congruently vaporizing compositions of zirconium dioxide in tungsten and rhenium have been determined over the temperature range 2350-2860 K. The vaporization behavior of substoichiometric zirconium dioxide has been investigated by a combination of mass effusion and mass spectrometric techniques in the range 1850-2860 K. The partial pressures of the gaseous species Zr(g), ZrO(g), ZrO_2(g), and O(g), as functions of temperature were determined at four compositions between ZrO_2 and the lower phase boundary of ZrO_2/sub -x/. From these results the standard Gibbs energies of formation of the substoichiometric dioxide were determined as functions of temperature and composition.

3603 Composite Materials

REFER ALSO TO CITATION(S) 63005

63265 **(LA-UR—82-1140) Nonconventional hard-metal compositions.** Sheinberg, H. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 10p. (CONF-821102—1). NTIS, PC A02/MF A01. Order Number DE82014051.

From 6. international conference on powder metallurgy; Brno, Czechoslovakia (10 Nov 1982).

Portions of document are illegible.

A novel hard-metal composition comprising borides and carbides of tungsten, nickel, and iron is made by reaction hot-pressing mixtures of elemental tungsten, nickel, and iron powders with small quantities of boron carbide. The hardness of these compositions is in the range of the hardest conventional tungsten carbide-cobalt compositions. It was subsequently determined that molybdenum can be substituted in part or totally for the tungsten in the composition with a minimum reduction in hardness. This new composition can be used in high-pressure anvils; it sustains higher pressures than commercial carbides without plastic deformation.

3604 Polymers And Plastics

REFER ALSO TO CITATION(S) 62784, 63298

63266 **A continuum analysis of a system of many 'real' chains confined between a pair of 'sticky' surfaces, with applications to the 'sandwich' model of bulk polymers.** Gaylord, R.J.; Kim, Y.H. (Univ. of Illinois at Urbana-Champaign). *Polymer Bulletin (Berlin);* **5**: 179-186(1981). Contract AC02-76ER01198.

An analysis is made of a system of many interacting chains confined between a pair of surfaces which exert a short range attraction on the chains. The free energy of the system is determined from the partition functions of the confined chains which are, in turn, determined by solutions to the self consistent field form of the diffusion equations with mixed boundary conditions. The incorporation of the analysis into the 'sandwich' model of bulk polymers is discussed.

3606 Other Materials

REFER ALSO TO CITATION(S) 62587, 62777, 62784, 62785, 62827, 62845, 63004, 63149, 63362

63267 (BMFT-FB-T—82-043) Thermodynamic properties of a suitable working-mixture for absorption-type heat pumps. Eichholz, H.D.; Schulz, S. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Apr 1982. 72p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750634.

In the last few years the critical energy situation has brought about a growing interest in the development of alternative, energy saving heating plants for conventional buildings with heat production of 10 to 25 kW for alternatively mono- or bivalent operating conditions. In the field of thermodynamics enormous progress may be achieved by an absorption-type heat pump process. This process has to be optimized with regard to the operating conditions and the mixture used as working fluid. By a critical selection of properties in this paper the binary mixture methanol lithium bromide is chosen as qualified working fluid for absorption-type heat pumps. To begin with available thermodynamic data of mixture properties are collected in an intensive literature search. They are then completed by vapour-liquid equilibrium measurements and heat of mixing experiments with the result of a theoretical correlation. This way, it will be possible to calculate and optimize a heat pump process with the binary mixture CH_3OH-LiBr. In addition all available thermodynamic properties of methanol are represented by a new fundamental equation.

63268 (CONF-810809—29) Study of coexistence of ferromagnetism and superconductivity in single-crystal $ErRh_4B_4$. Sinha, S.K.; Crabtree, G.W.; Hinks, D.G.; Mook, H. (Oak Ridge National Lab., TN (USA); Argonne National Lab., IL (USA)). Sep 1981. Contract W-7405-ENG-26. 19p. NTIS, PC A02/MF A01. Order Number DE82020927.

From 16. international conference on low temperature physics; Los Angeles, CA, USA (19 Aug 1981).

Portions of document are illegible.

Neutron diffraction and resistivity measurements on single crystals of $ErRh_4B_4$ have revealed that both superconductivity and ferromagnetic order coexist in this material between 0.71 K and 1.2 K. In this intermediate phase, a linear polarized modulated structure with a wavelength of approximately 100 A is observed. The modulated moment increases faster than the ferromagnetic moment down to 0.71 K and then disappears suddenly, with loss of superconductivity and a transition to a normal ferromagnetic state. This transition is accompanied by temperature hysteresis of about 60 mK. The same hysteresis, in the inverse sense, is exhibited by the ferromagnetic component. The intermediate phase is interpreted as being one of coexisting normal ferromagnetic domains and superconducting sinusoidally ordered domains.

63269 (CONF-820929—5-Draft) Induced magnetic form factor of the mixed-valence material $Sm_{0.76}Y_{0.24}S$. Moon, R.M.; Liu, S.H.; Werner, K. (Oak Ridge National Lab., TN (USA)). Jul 1982. Contract W-7405-ENG-26. 10p. NTIS, PC A02/MF A01. Order Number DE82022299.

From IUPAP international conference on magnetism; Kyoto, Japan (6 Sep 1982).

Using the polarized neutron technique, we have measured the induced magnetic form factor of $Sm_{0.76}Y_{0.24}S$. Our results can be interpreted in terms of a model in which the mixed-valence ground state is a linear combination of ($4f^6$) and ($4f^5 5d$) configurations with parallel spins. By fitting this model to the observed form factor we conclude that the valence of Sm is 2.09 +- 0.01, which is much smaller than obtained by interpreting lattice constant measurements.

63270 (DOE/ET/21070—T1) Protective coatings for front-surface reflectors. Phase I. Final report. Dennis, W.E. (Dow Corning Corp., Midland, MI (USA)). Sep 1979. Contract AC02-78ET21070. 40p. NTIS, PC A03/MF A01. Order Number DE82019931.

Portions of document are illegible.

Silicone resins were evaluated as protective coatings for front surface aluminum and silver reflectors. The solar weighted hemispherical reflectances and specular reflectances of float glass squares metallized with silver and aluminum and protected with silicone coatings were measured. The float glass squares metallized with silver and aluminum were highly reflective. The total reflectances of the silver samples were 5 to 7% higher than the aluminized samples. The resin coated aluminum samples were much more specular than the silver samples. Coupling agents used to improve the adhesion of the protective silicone resin coating to the silver surface adversely affected the specularities. The reflectances of the aluminumized squares were remeasured after 500 hours exposure in an Atlas Filtered WeatherOmeter. Front surface aluminum reflectors can be protected with silicone resin coatings.

63271 Near-surface segregation in irradiated Ni_3Si. Wagner, W.; Rehn, L.E.; Wiedersich, H. (Argonne National Lab., IL (USA)). *Philosophical Magazine, [Part] A: Defects and Mechanical Properties;* **45**: No. 6, 957-972(Jun 1982).

The radiation-induced growth of Ni_3Si films on the surfaces of Ni(Si) alloys containing =< 13 at.% Si is well established. Additional segregation of silicon during irradiation within the ordered Ni_3Si phase has been observed. Post-irradiation depth profiling by Auger electron spectroscopy, as well as in situ analysis by high-resolution Rutherford backscattering spectrometry, reveals Si-enrichment at the surfaces of Ni(Si) alloys in excess of stoichiometric Ni_3Si during irradiation. Thin, near-surface layers with silicon concentrations of 28 to 30 at.% are observed, and even higher Si enrichment is found in the first few atom layers. Transmission electron microscopy and selected area-electron diffraction were employed to characterize these Si-enriched layers. A complex, multiple-spot diffraction pattern is observed superposed on the diffraction pattern of ordered Ni_3Si. The d-spacings obtained from the extra spots are consistent with those of the orthohexagonal intermetallic compound Ni_3Si_2.

63272 Epitaxial reordering of ion-irradiated $NiSi_2$ layers. Maeenpaeae, M.; Hung, L.S.; Nicolet, M.A. (California Inst. of Tech., Pasadena (USA)); Sadana, D.K. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.); Lau, S.S. (California Univ., San Diego, La Jolla (USA)). *Thin Solid Films;* **87**: No. 3, 277-284(22 Jan 1982).

Thermally grown (at about 800°C) epitaxial $NiSi_2$ layers on silicon single-crystal substrates were ion irradiated at liquid nitrogen temperature so that the surface region was nearly amorphous but with a crystalline $NiSi_2$ seed near the $NiSi_2$-Si interface. The epitaxial reordering of the highly defective region occurs in a layer-by-layer manner and at relatively low temperatures (about 80°C). The activation energy for regrowth was found to be 1.2 +- 0.2 eV. These results indicate that the growth characteristics of $NiSi_2$ without mass transport are drastically different from those where mass transport is required such as in the case of thermally formed $NiSi_2$ from Ni/c-Si couples (where c-Si denotes crystalline silicon).

63273 The vitreous silica surface: consequences of grinding and polishing. Primak, W. (Argonne National Lab., IL). *Physics and Chemistry of Glasses;* **22**: No. 2, 43-47(Apr 1981).

Evidence for a compacted layer on the surface of polished vitreous silica was sought but not found. Instead, it was found that grinding (lapping or abrasion) produced a layer showing several percent expansion and stress ~ 10^5 lb/in^2. This layer is less than 1 μm thick. It can be removed by polishing or by etching. It is the cause of the Twyman Effect.

63274 Expression and analysis of pore fluids from hardened cement pastes and mortars. Barneyback, R.S. Jr.; Diamond, S. (Purdue Univ., West Lafayette, IN). *Cement and Concrete Research;* **11**: 279-285(1981).

A device is described that has been used for several years for expression of pore solution from hardened portland cement pastes and mortars. Particulars with respect to the design, fabrication, and operation of such equipment are given, and methods for the analysis of the resulting small volumes of pore solutions are briefly discussed. It is believed that the compositions of the pore solutions obtained are representative of that of the bulk of the pore solution within the paste or mortar from which the solutions have been obtained.

63275 **A new method for the preparation of fast-conducting, reactive glass systems.** Susman, S.; Boehm, L.; Volin, K.J.; Delbecq, C.J. (Argonne National Lab., IL). *Solid State Ionics;* **5**: 667-670(1981).

A relatively simple apparatus has been designed for synthesizing glasses in a controlled environment at temperatures up to 1050°C. The glasses are cast in disc form - a geometry suited for experimental measurement without further sample alteration. This arrangement has enabled us to extend the region of glass formation in the binary system Na_2S:GeS_2 and to prepare a glass with as high as 70 mole % of Na_2S. This glass shows a conductivity of 1.0 x 10^{-3} Ω^{-1} cm^{-1} (100°C)-higher than the best sodium conducting glasses currently known. Using the new method, a completely new Na_2S:B_2S_3 glass system has been prepared. The electrical conductivity of these samples has been measured as a function of frequency in the range 1 Hz to 7 x 10^5 Hz and in the temperature range of -5°C to +150°C. Replacement of the oxygen atom by a sulphur atom (comparison with oxide glasses at the same composition) is found to improve the ionic conductivity.

63276 **The Haven ratio in the vicinity of order/disorder transitions in some two-dimensional lattice gases.** Murch, G.E. (Argonne National Lab., IL). *Solid State Ionics;* **5**: 117-120(1981).

This paper reports on Monte Carlo results for the Haven Ratio in two square planar lattice gases. In the first, which has nearest neighbor exclusion, the Haven ratio decreases with increasing occupation, exhibits a minimum and goes to infinity at the known second-order phase transition. This is shown to be a percolation effect. In the second, which has nearest and next nearest neighbor exclusion, the Haven ratio decreases monotonically. This suggests the absence of a strong transition which is in agreement with other findings.

40 CHEMISTRY

4001 Analytical And Separations Chemistry

REFER ALSO TO CITATION(S) 62569, 62578, 62578, 62585, 62585, 62623, 62721, 62740, 62762, 62780, 62780, 62794, 63225, 63247, 63467, 63476

63277 **(BMFT-FB-T—82-010) Measurements of the electrophoretic mobility with a new laser Doppler cytopherometer (Lazypher) and critical evaluation of the electrophorese mobility-test (EMT).** Hoffmann, W. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Jan 1982. 44p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750502.

The new developed Laser Doppler Cytopherometer (Lazypher) allows the exact and objective measurement of the electrophoretic mobility of particles. Comparative experiments with the Free Flow Cell Electrophoresis instrument of Hannig showed identical results. The impression that the electrophoretic Mobility Test (EMT) is not valid for cancer diagnosis has been substantiated. But in its present form with the new instrument (Lazypher) possible improvements, e.g. isolation of lymphocytes, purification of antigens or indicator particles, can be estimated objectively for their value for the test system.

63278 **(CONF-820869—1-Draft) Multilayer relaxation in metallic surfaces as demonstrated by LEED analysis.** Davis, H.L.; Noonan, J.R. (Oak Ridge National Lab., TN (USA)). Jul 1982. Contract W-7405-ENG-26. 16p. NTIS, PC A02/MF A01. Order Number DE82020892.

From 5. European conference on surface science; Gent, Belgium (24 Aug 1982).

Theoretical motivations are reviewed for investigation of multilayer relaxation in relatively simple metallic surfaces. Results from LEED analyses are presented which serve to demonstrate that multilayer relaxation measurably exists in Cu(100) and Cu(110) surfaces. The results from two independent LEED analyses for Cu(110) are shown to be in much better agreement with each other than the LEED results are with multilayer relaxation results obtained by high energy ion scattering. Multilayer relaxation results for other metallic surfaces also are reviewed briefly, and all available results are discussed in relationship to those obtained by a theoretical, model-type, inquiry of Landman, Hill and Mostoller.

63279 **(CONF-820870—1-Draft) Equivalent beam averaging (EBA) of I-V spectra for LEED analysis.** Davis, H.L.; Noonan, J.R. (Oak Ridge National Lab., TN (USA)). Aug 1982. Contract W-7405-ENG-26. 15p. NTIS, PC A02/MF A01. Order Number DE82020829.

From Nordic conference on surface science; Tampere, Finland (18 Aug 1982).

An equivalent beam averaging (EBA) procedure is described which has proved to be very useful to enhance I-V profile data collected for LEED analyses. Specific analyses are documented where application of EBA has led to improved agreement between calculated and experimental I-V profiles. The procedure also has been substantiated by examination of representative I-V profiles which were calculated to correspond to the incident beam slightly misaligned from, and exactly aligned with, the surface normal. It then has been inferred from such substanstiation that use of EBA in a LEED analysis reduces the effects of systematic experimental errors caused by minor misalignment of the incident beam, beam divergence, and certain surface morphologies.

63280 **(DOE/PC/40809—6) Separation of asphaltenes using high-resolution supercritical-fluid chromatography. Progress report, June 1, 1982-August 31, 1982.** Jackson, W.P.; Richter, B.E.; Fjeldsted, J.C.; Peaden, P.A.; Lee, M.L. (Brigham Young Univ., Provo, UT (USA). Dept. of Chemistry). 1982. Contract FG22-81PC40809. 22p. NTIS, PC A02/MF A01. Order Number DE82021342.

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For the period of June through August effort was concentrated on instrumental development and column technology. The fluorescence detection supercritical-fluid chromatography (SFC) system was equipped with fiber optics. Computer-controlled, rapid-scanning was developed and tested for the fluorescence SFC. A third SFC system was designed and constructed with flame ionization detectors. This system was designed for the evaluation of carbon dioxide and other similar potential mobile phases. Asphaltene fractions were obtained and characterized by uv spectroscopy as a preliminary to chromatographic analysis. A new stationary phase for SFC was synthesized and evaluated. Considerable effort was expended to resolve the technical difficulties of coating narrow-bore capillary columns. 9 figures, 1 table.

63281 **(DOE/PC/40809—T3) Separation of asphaltenes using high-resolution supercritical-fluid chromatography. Progress report, March 1, 1982-May 31, 1982.** Jackson, W.P.; Richter, B.E.; Fjeldsted, J.C.; Peaden, P.A.; Lee, M.L. (Brigham Young Univ., Provo, UT (USA). Dept. of Chemistry). 1982. Contract FG22-81PC40809. 43p. NTIS, PC A03/MF A01. Order Number DE82015649.

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During this quarter more polar stationary phases were developed and tested for application to supercritical fluid chromatography. The studies initiated during the previous quarter into the dependence of the chromatography on pressure, viz., density, were continued in-depth. The on-column fluorimetric detector was modified for greater sensitivity. In addition, some brief studies were done using propane as a carrier as well as isopropanol-doped n-pentane. Synthesis of 50% and 70% phenyl methylphenylpolysiloxane polymers and their in-situ free radical crosslinking with peroxides was accomplished. Chromatographic evidence of coal tar is presented that illustrates the high efficiency and thermal stability of these phases when coated on fused silica capillary columns. 20 figures.

63282 (DOE/RL/02225—T11-1) Dynamics of solvent extraction systems. III. Progress report No. 3, October 1, 1969-September 30, 1970. Babb, A.L.; Garlid, K.L. (Washington Univ., Seattle (USA). Dept. of Nuclear Engineering). Oct 1970. Contract AM06-76RL02225. 89p. (RLO—2225-T11-1). NTIS, PC A05/MF A01. Order Number DE82022536.

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The dynamic behavior of solvent extraction systems is not simple, but understanding the dynamics and applying the results to specific systems can lead to large improvements in overall extraction efficiency and throughput. This was the general hypothesis behind the research conducted during the past year, and the results have confirmed that hypothesis. Primary emphasis was placed on experiments which used controlled cycling operation of a pulsed, sieve-plate extraction column. Exploratory studies had been conducted during the previous year and showed that controlled cycling had good potential. In most solvent extraction systems the dependent, measurable variables are not smoothly varying functions of time, but exhibit strong random variations. This year, for the first time, the random variations in organic phase holdup were measured and analyzed. A single, fluorometric detector was used whose output was proportional to the instantaneous holdup. This signal in turn was converted to digital form and autocorrelation and power spectral density functions were calculated. A computer model for describing typical dynamic operation of extraction systems has been developed. It describes each stage of a general dynamic operation and couples the stages together. The code has been compiled and is operational. It requires the knowledge of several parameters which are not well known, however.

63283 (DOE/RL/02225—T11-3) Liquid and gas phase separations I. Progress report No. 1, October 1, 1971-September 30, 1972. Babb, A.L.; Garlid, K.L. (Washington Univ., Seattle (USA). Dept. of Nuclear Engineering). Oct 1972. Contract AM06-76RL02225. 101p. (RLO—2225-T11-3). NTIS, PC A06/MF A01. Order Number DE82022534.

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Extensive analysis of random data obtained from two fluorometric detectors measuring the time-varying organic volume fraction at different locations in a pulsed, solvent extraction column has been performed. Results show that cross-correlation and cross-spectral density functions are sensitive indicators of process conditions, and may be used in an on-line monitoring system to give an early indication of column flooding or other anomalous behavior. The report describes in detail the methods of analysis used, in particular the incorporation of the Fast Fourier Transform method, and describes results obtained. The effects of hard-limiting the data, i.e., transforming the series of discrete numerical values to a binary series having a value of either +1 or -1, were also examined. Analysis of the statistical functions obtained after the transformation showed that there was little loss of information, and that this would be a very effective way of reducing the computer storage capacity required for an on-line process monitoring system. Gas-phase separations using semi-permeable membranes have also been investigated. This work is in its early stages, however, since several delays were encountered. A new diffusion test cell assembly was designed and constructed, and a different counting cell was assembled. Measurement of actual permeabilities and separation factors is proceeding. 57 figures.

63284 (DOE/RL/02225—T11-4) Liquid-and gas-phase separations. II. Progress report No. 2, October 1, 1972-September 30, 1973. Babb, A.L.; Garlid, K.L. (Washington Univ., Seattle (USA). Dept. of Nuclear Engineering). Nov 1973. Contract AM06-76RL02225. 87p. (RLO—2225-T11-4). NTIS, PC A05/MF A01. Order Number DE82022533.

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Investigations were conducted of (1) using spectral analysis of on-line organic volume fraction data for determining basic process information in pulsed, solvent extraction columns and (2) the use of semi-permeable membranes for separating krypton-85 from nitrogen. Earlier investigations of extraction column data had shown that anomalies such as incipient flooding could be detected at an early stage of their development by random signal analysis. Column operation was modified to eliminate some sources of extraneous noise and data were recorded and digitally filtered to remove the intrinsic periodic variations that are caused by the pulsing action. Filtered data were carefully analyzed in order to reveal basic process information, such as relative phase velocities and longitudinal dispersion. All efforts, however, were unsuccessful, despite a high level of sophistication in data processing. Process information was apparently masked by dispersion of the pulsing action and by successive disintegration of packets of aqueous and organic phases that occurred in passing through the sieve plates. Data were obtained on separation factors of krypton and nitrogen from a test cell, and were repeatable for a given membrane, but showed great disparity between membranes. The disparity was found to be due to poor quality control of membranes, hysteresis effects following specific pressurization history, and the degree of pre-stressing to which the membranes were subjected.

63285 (DOE/RL/02225—T11-5) Separation efficiency of pulsed extraction columns; dynamics of solvent extraction systems; and liquid and gas phase separations. Final report, January 1, 1957-December 31, 1973. Babb, A.L.; Garlid, K.L. (Washington Univ., Seattle (USA). Dept. of Nuclear Engineering). Jul 1974. Contract AM06-76RL02225. 20p. (RLO—2225-T11-5). NTIS, PC A02/MF A01. Order Number DE82022532.

This is the final summary report for research carried out during the past 16 years on the following three projects: separation efficiencies of pulsed extraction columns; dynamics of solvent extraction systems; liquid and gas phase separations. The highlights of the accomplishments are given for each contract period and appropriate references to progress reports, journal articles, theses and dissertations, are given in the text.

63286 (DPSPU—81-30-8) Design and development of a remote dispensing buret. Goergen, C.R.; Petty, W.E.; Gelsie, M. Jr.; Linn, M.G. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Plant). 1981. Contract AC09-76SR00001. 9p. (CONF-811025—27). NTIS, PC A02/MF A01. Order Number DE83000678.

From 25. conference on analytical chemistry and nuclear technology; Gatlinburg, TN, USA (6 Oct 1981).

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The Savannah River Plant is designing a dispensing buret for remote use in shielded analytical cells for dilution of highly radioactive solutions. More stringent safeguards analytical methods require the ability to dispense microliter volumes of sample with high accuracy and precision. Design goals and principles are discussed with a description of the prototype system. 3 figures.

63287 (K/TL/AT—142) Quantitative infrared spectrophotometry: empirical extrapolation from calibration conditions. Hedge, W.D.; Turner, C.M. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). Aug 1982. Contract W-7405-ENG-26. 25p. NTIS, PC A02/MF A01. Order Number DE83000052.

Quantitative infrared spectrophotometry measurements of infrared active compounds in the gaseous phase depend upon many variables, some of which are dependent on instrument capabilities, environmental conditions, and sample definitions. In quantitative measurements, calibration of an instrument in a set environment provides the necessary constants to determine the concentration of a particular compound in a sample gas. However the constants may change if the conditions of measurement vary. This study concerns estimating infrared constants when the following conditions change from calibration conditions using a particular infrared spectrophotometer (25-mm AgCl windows): pathlength, sample temperature, absorptivity level, and scanning speed. The intent of the study is to make users of process control infrared spectrophotometers aware that varying conditions affect results obtained from such instruments. Equations for the four specific condition changes explored are: Pathlength, $K/sub\ c/ = K_o\ (L_o/L)$; Temperature, $K/sub\ c/ = K_o\ (T/T_o)^2$; Absorptivity, $K/sub\ c/ = (K_o)\exp[-(\text{Log } A)^2/7]$; and Scanning Speed, $K/sub\ c/ = K_o(1.000 + 0.00032(S - S_o))$, where K is the infrared constant, L is pathlength, T is absolute temperature, A is the absorbance, and S is scanning speed. The subscript c and o refer to corrected and original (calibration) values, respectively.

63288 **(KFK—3236) New X-ray fluorescence analysis method for the on-line determination of element contents in flotation slurries.** Lubecki, A.; Wiese, K. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Lab. fuer Isotopentechnik). Dec 1981. 33p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750626.

By the example of the $BaSO_4$ determination in fluorite concentrates an (XRFA method is reported which allows the continuous determination of element contents in flotation slurries. The sample to be analyzed is placed between the excitation source and the detector. X-ray transmission geometry is employed here. This provides the possibility of recording also primary radiation besides the element specific X-rays. By placing a target in the beam path additional X-rays are excited, which transmission can be measured by the detector. The mathematical linking of these variables, allows to determine the concentration of the wanted element in the solid of the pulp. Measurement of the density of the slurry, which has been necessary until now, can be dispensed with in the future. The analytical equipment GRAF designed at the laboratory according to this concept of measurement with a view to a first testing of the method will be presented. The result of testing of the method in the experiment with 64 calibration pulps prepared have confirmed the applicability of the method for on-line measurements. For the given concentration range of 0-5% $BaSO_4$ the accuracy of analysis is better than +-0.1% absolute.

63289 **(LA-UR—82-2590) Automated activation-analysis system.** Minor, M.M.; Garcia, S.R.; Denton, M.M. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 11p. (CONF-820958—1). NTIS, PC A02/MF A01. Order Number DE83000330.

From 4. symposium on nulcear chemistry, radiochemistry and radiation chemistry; Mexico City, Mexico (7 Sep 1982).

An automated delayed neutron counting and instrumental neutron activation analysis system has been developed at Los Alamos National Laboratory's Omega West Reactor (OWR) to analyze samples for uranium and 31 additional elements with a maximum throughput of 400 samples per day.

63290 **(MLM—2961-OP) Nondestructive evaluation of sampling error for plutonium assay.** Seiler, R.J.; Rodenburg, W.W.; Strohm, W.W. (Mound Facility, Miamisburg, OH (USA)). 1982. Contract AC04-76DP00053. 6p. (CONF-821103—9). NTIS, PC A02/MF A01. Order Number DE82019174.

From American Nuclear Society winter meeting; Washington, DC, USA (14 Nov 1982).

Plutonium chemical assay discrepancies involving PuO_2 and $(U, Pu)O_2$ powders are often caused by a sampling error due to nonhomogeneity of the plutonium concentration and by absorption of several compounds, such as water and carbon dioxide, which render a sample nonrepresentative of the material from which it was drawn. Two techniques have been developed to address these problems. First, a calorimetric watts/gram (W/g) test on the parent material and each pre-weighed sample provides a precise measure of the plutonium elemental and isotopic homogeneity at the time of sampling. Second, total dissolution of the pre-weighed sample for chemical assay eliminates the effects of changes in the sample subsequent to weighing. The W/g test for homogeneity has been demonstrated to be effective and has several potential applications not explicitly addressed in this paper. For shipper-receiver measurements and for inspection samples, representativeness of the samples is demonstrated prior to submission for analysis. Further, prior demonstration of representativeness can result in fewer samples submitted for analysis. Correction for nonhomogeneity through the W/g test on parent material and pre-weighed samples should be investigated.

63291 **(MLM—2981) Guide to plutonium isotopic measurements using gamma-ray spectrometry.** Lemming, J.F.; Rakel, D.A. (Mound Facility, Miamisburg, OH (USA)). 26 Aug 1982. Contract AC04-76DP00053. 30p. NTIS, PC A03/MF A01. Order Number DE82021904.

Purpose of this guide is to assist those responsible for plutonium isotopic measurements in the application of gamma-ray spectrometry. Objectives are to promote an understanding of the measurement process, including its limitations and applicability, by reviewing the general features of a plutonium spectrum and identifying the quantities which must be extracted from the data; to introduce state-of-the-art analysis techniques by reviewing four isotopic analysis packages and identifying their differences; to establish the basis for measurement control and assurance by discussing means of authenticating the performance of a measurement system; and to prepare for some specific problems encountered in plutonium isotopic analyses by providing solutions from the practical experiences of several laboratories. 29 references, 12 figures, 17 tables.

63292 **(PNL—3986) Techniques for the quantitative analysis of fission-product noble metals.** Lautensleger, A.W.; Hara, F.T. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 37p. NTIS, PC A03/MF A01. Order Number DE82022212.

Analytical procedures for the determination of ruthenium, rhodium, and palladium in precursor waste, solvent metal, and final glass waste forms have been developed. Two procedures for the analysis of noble metals in the calcine and glass waste forms are described in this report. The first is a fast and simple technique that combines inductively coupled argon plasma atomic emission spectrometry (ICP) and x-ray fluorescence techniques and can only be used on nonradioactive materials. The second procedure is based on a noble metal separation step, followed by an analysis using ICP. This second method is more complicated than the first, but it will work on radioactive materials. Also described is a procedure for the ICP analysis of noble metals in the solvent metal matrix. The only solvent metal addressed in this procedure is lead, but with minor changes the procedure could be applied to any of the solvent metals being considered in the Pacific Northwest Laboratory (PNL) extraction process. A brief explanation of atomic spectroscopy and the ICP analytical process, as well as of certain aspects of ICP performance (interelement spectral line interferences and certain matrix effects) is given.

63293 (ZfI-Mitt—39, pp 55-72) **Selected examples of application of tracer techniques in industry.** Otto, R.; Koennecke, H.G.; Hecht, P.; Ulrich, H. Jun 1981. (In German). Dep. NTIS (US Sales Only).

From KDT meeting on isotopes for rationalization in industry; Leipzig, German Democratic Republic (4 Jun 1980).

The paper deals with some selected applications of radiotracers in industry. The mobile system of measurement is described. Valuable results could be obtained regarding to the technology of sewage purification, preparing sand for moulding, and evaporation.

63294 **Gas-chromatographic analysis for benzene in blood.** Jirka, A.M.; Bourne, S. (Argonne National Lab., IL). *Clinical Chemistry (Winston-Salem, North Carolina);* **28**: No. 7, 1492-1494(Jul 1982).

In this improved method of analysis for benzene in blood samples, 0.4 mL of blood is extracted with toluene and the extract is then analyzed by automated gas chromatography. The stability of samples for up to a week before analysis, the precision of the method in various concentration ranges, and the quantitative recovery of benzene in the concentration ragne of 0.1 to 10 mg of benzene per liter of blood are also discussed.

63295 **Complexiметric titration of thorium with potentiometric end-point indication.** Baumann, E.W. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). *Analytica Chimica Acta;* **138**: 391-396(1 Jun 1982).

In this redox-based direct potentiometric method, thorium is titrated with ethylenediaminetetraacetic acid (EDTA) in the presence of the Cu(II)-EDTA complex and ammonium thiocyanate. The indicator electrode is platinum. Solutions of irradiated thorium fuel, with less than 25 μmol in a sample aliquot, can be titrated. Solutions used to dissolve thorium samples contain aluminum, which can be masked kinetically, by pH adjustment, or with oxalate. Metal ions forming EDTA complexes with stability constants similar to or greater than that of copper(II) interfere.

63296 **Detection of S_2 by magnetic tuning of a chromium(I) atomic emission line.** Cuellar, E.; Brown, N.J. (Lawrence Berkeley Lab., CA). *Journal of Physical Chemistry;* **86**: No. 11, 1966-1969(27 May 1982). Contract W-7405-ENG-48.

A technique called tunable atomic line molecular spectroscopy (TALMS) was utilized to detect S_2 by absorption of a Cr(I) atomic emission line at 3018 A. The Cr line was split into Zeeman components, and a differential absorption measurement was obtained as a function of magnetic field strength. Several closely spaced lines belonging to different branches which result from the triplet splitting in the (7,2) band of the B³Σ/sub u/⁻-X³Σ/sub g/⁻ system of S_2 were resolved. A resolution greater than 6 x 10^4 was demonstrated.

63297 **PIXE: early NAA revisited.** Lyon, W.S. (Oak Ridge National Lab., TN (USA)). *Radiochemical and Radioanalytical Letters;* **51**: No. 4, 193-197(8 Apr 1982).

A short, comparative evaluation of the methods of neutron activation analysis (NAA), and particle induced X-ray emission (PIXE), is given based on the Proc. of the 2nd international conference on PIXE and its analytical applications. The conference took place June 9-12, 1980, Lund, Sweden. 'The PIXE people have paralleled NAA people - in work, problems and mistakes, summarises the author, but PIXE was proved and established as a standard analytical method.' The method has proved extremely valuable in microprobe applications.

63298 **Studies of magnetic resonance phenomena in polymers. I. The effects of free volume and segmental mobility on the motion of nitroxide spin probes and labels in poly(methyl methacrylate).** Tsay, F.D.; Hong, S.D.; Moacanin, J.; Gupta, A. *Journal of Polymer Science, Polymer Physics Edition;* **20**: No. 4, 763-772(Apr 1982).

Thin films of spin-probed and spin-labeled poly(methyl methacrylate) have been examined by electron spin resonance (ESR) at X-band frequency (9.2 GHz) and at various temperatures. Direct spectral evidence is presented to indicate that the composite ESR spectra observed in a certain temperature range originate from two states of distinctly different mobility, one with slow motions corresponding to a glassy state and the other with fast motions corresponding to a liquidlike state. The coexistence of these two states at temperatures considerably below the glass transition temperature can be explained as a result of the effect of free volume in a solid polymeric glass.

63299 **On the ion chromatographic determination of S(IV).** Dasgupta, P.K. (University of California, Davis). *Atmospheric Environment;* **16**: No. 5, 1265-1268(1982).

Ion chromatographic determination of S(IV) is described with special reference to the determination of SO_2(g) and/or aerosol S(IV) along with chloride, nitrate and sulfate in particulate matter. A method is presented for the baseline separation of the above species. The chromatographic behavior of hydroxymethanesulfonate under various eluent conditions is discussed.

63300 **Abnormal high density lipoproteins in cerebrotendinous xanthomatosis.** Shore, V. (Lawrence Livermore Lab., CA); Salen, G.; Cheng, F.W.; Forte, T.; Shefer, S.; Tint, G.S. *Journal of Clinical Investigation;* **68**: 1295-1304(Nov 1981). Contract W-7405-ENG-48.

The plasma lipoprotein profiles and high density lipoproteins (HDL) were characterized in patients with the genetic disease cerebrotendinous xanthomatosis (CTX). The mean HDL-cholesterol concentration in the CTX plasmas was 14.5 +/- 3.2 mg/dl, about one-third the normal value. The low HDL-cholesterol reflects a low concentration and an abnormal lipid composition of the plasma HDL. Relative to normal HDL, the cholesteryl esters are low, free cholesterol and phospholipids essentially normal, and triglycerides increased. The ratio of apoprotein (apo) to total cholesterol in the HDL of CTX was two to three times greater than normal. In the CTX HDL, the ratio of apoAI to apoAII was high, the proportion of apoC low, and a normally minor form of apoAI increased relative to other forms. The HDL in electron micrographs appeared normal morphologically and in particle size. The adnormalities in lipoprotein distribution profiles and composition of the plasma HDL result from metabolic defects that are not understood but may be linked to the genetic defect in bile acid synthesis in CTX. As a consequence, it is probable that the normal functions of the HDL, possibly including modulation of LDL-cholesterol uptake and the removal of excess cholesterol from peripheral tissues, are perturbed significantly in this disease.

63301 **Liquid scintillation counting: Recent trend in the assay of nuclides of biological interest.** Ross, H.H. (ORNL, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **39**: 28-29(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63302 **Simple accurate environmental alpha assay by a liquid scintillation method.** McDowell, W.J. (ORNL, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **39**: 62-63(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63303 **Transuranic activity measurements in environmental samples with a Si(Li)-Na(T1) photon spectrometer.** Pehl, R.H.; Sherman, I.S.; Strauss, M.G. (LBL, Berkeley, CA 94720). *Transactions of the American Nuclear Society;* **39**: 95-97(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63304 **Polonium-210 assay using a background-rejecting extractive liquid scintillation method.** Case, G.N.; McDowell, W.J. (ORNL, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **39**: 106-108(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

4002 Inorganic And Physical Chemistry

REFER ALSO TO CITATION(S) 62806, 63089, 63247, 63254, 63276, 63319

63305 **(DOE/ER/10829—2) Selectivity, activity, and metal-support interactions of Rh bimetallic catalysts. Progress report, 15 November 1981-15 August 1982.** Haller, G.L. (Yale Univ., New Haven, CT (USA). Dept. of Chemical Engineering). Aug 1982. Contract AC02-81ER10829. 18p. NTIS, PC A02/MF A01. Order Number DE82021045.

Portions of document are illegible.

We report on a detailed investigation of the effect of TiO_2 support on Rh-Ag interaction as exhibited in catalytic activity. The temporal evolution of activity over Rh-Ag/TiO_2 for ethane hydrogenolysis and hydrogen chemisorption as a function of temperature, Ag to Rh ratio, the Rh particle size, Rh loading, and ambient gas were studied. Preliminary extended x-ray absorption fine structure (EXAFS) analysis of Rh/TiO_2 catalysts indicate that 100% exposed (dispersed) catalyst prepared by ion exchange may be atomically dispersed after low temperature reduction. 7 figures, 1 table.

63306 **(DOE/ER/70234—T1) Mass transfer and chemical reaction of gaseous species in non-catalytic and catalytic porous media supporting catalytic and non-catalytic liquids.** Rinker, R.G. (California Univ., Santa Barbara (USA). Dept. of Chemical and Nuclear Engineering). 1981. Contract AT03-76ER70234. 7p. NTIS, PC A02/MF A01. Order Number DE82021713.

Results of a research program aimed at obtaining fundamental understanding about the kinetic and transport behavior of supported liquid-phase catalysts (SLPC) are summarized. Details of the research are provided in the appended journal publications. In addition, several graduate theses resulted from the research. Their titles and the students names are listed in the main body of the report.

63307 **(HMI-B—362) 50 years dynamics of chemical reactions.** (Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.)). Oct 1981. 83p. (CONF-8110153—Absts.). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82905946.

From Conference on 50 years dynamics of chemical reactions; West Berlin, F.R. Germany (12 Oct 1981).

Portions of document are illegible.

Some of the topics covered by the approximately 70 abstracts are: collisions, energy transfer and kinetics, dissociation, reactions of nitrous oxide, photoreactions, charge transfer, reactions of hydrogen, and reactions of organic, inorganic, and rare gas molecules. (DLC)

63308 **(MLM—2990-OP) Reaction rates for the formation of DT under various conditions from T_2 + D_2.** McConville, G.T.; Menke, D.A.; Ellefson, R.E. (Mound Facility, Miamisburg, OH (USA)). 1982. Contract AC04-76DP00053. 4p. (CONF-821111—3). NTIS, PC A02/MF A01. Order Number DE82021346.

From 29. national symposium on American Vacuum Society; Baltimore, MD, USA (16 Nov 1982).

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The dependence of the reaction rate on T_2 concentration was measured at 275, 195, and 77°K. The reaction rate is extremely fast at 195°K. (DLC)

63309 **(MLM—3000(OP)) Mutual diffusion coefficients of He-Ne and He-Xe from 350 to 1300 Kelvin.** Taylor, W.L.; Cain, D. (Mound Facility, Miamisburg, OH (USA)). 1982. Contract AC04-76DP00053. 17p. NTIS, PC A04/MF A01. Order Number DE82021293.

Portions of document are illegible.

Measurements were made in a Hastelloy-X diffusion cell. The apparatus is mounted vertically in a Lindberg furnace. Helium is introduced into the upper chamber simultaneously with either neon or xenon in the lower chamber and, as the gases diffuse, samples are withdrawn. Sample analyses were made on a mass spectrometer. Measured diffusion coefficients agreed well with previously published data using an independent experimental method. Marrero and Mason correlations, were verified. Mutual consistency relations which exist among the transport properties were used to establish the degree of agreement between mixture viscosities, corresponding states correlations and the diffusion coefficient. Comparison with theoretical diffusion coefficients from intermolecular potentials was made. The HFD potential reproduced the available experimental data best for He-Ne while He-Xe data were best represented by the (m-6-8) potential. 3 figures.

63310 **Electronic structure of C-Li, Si-H, and Si-Li in the lowest $^4u^-$ and ^{2}PI states.** Mavridis, A. (Argonne National Lab., IL); Harrison, J.F. *Journal of Physical Chemistry;* **86**: No. 11, 1979-1985(27 May 1982).

We have studied the electronic structure of C-Li, Si-Li, and Si-H in the $^4\Sigma^-$ and ^{2}pI states using ab initio SCF, MCSCF, and CI techniques. We find that, while Si-H is similar to C-H, having a ^{2}PI ground state with the $^4\Sigma^-$ approximately 36 kcal mol^{-1} higher, both C-Li and Si-Li have $^4\Sigma^-$ ground states with the ^{2}II being 33 and 14 kcal mol^{-1} higher, respectively. Potential energy curves and spectroscopic constants are presented for the three title molecules, and some speculation as to the possible consequences of the $^4\Sigma^-$ ground state of Si-Li and C-Li is indulged in.

4003 Organic Chemistry

REFER ALSO TO CITATION(S) 62582, 62582, 62674, 62806, 63305, 63306

63311 **(UCID—19571) Study of the degradation of two candidate diffusion-pump oils, Krytox and Fomblin. Final report.** Pearson, R.K.; Happe, J.A.; Barton, G.W. Jr. (Lawrence Livermore National Lab., CA (USA)). 27 Sep 1982. Contract W-7405-ENG-48. 64p. NTIS, PC A04/MF A01. Order Number DE83000656.

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Activation energies were determined for decomposition of Fomblin HVAC 18/8 and Krytox 143AY oils (two perfluorinated polyethers) (respectively 60.6 kcal/mole and 55.6 kcal/mole) in the temperature range of 325° to 405°C in a monel vessel. At any temperature in this range, Fomblin decomposes 30 +- 10 times faster than Krytox. The estimated decomposition in 10 years at 250°C is 0.14% for Fomblin and 0.009% for Krytox. Effects of 304 ss and aluminum were determined. Although differences in the fluorine NMR spectrum of different batches of Krytox are observed, there are no significant changes detected between aged and unaged oils of the same batch. HF does not react with Krytox at 405°C. Krytox can be chromatographed in spite of its high average molecular weight (3600 amu). GCMS showed that each smaller peak contained C_2F_4H-groups while the larger peaks contained only C_2F_5-groups. Hydrogen NMR on Krytox showed the C_2F_4H- to be CF_2CHF-groups. Chromatography of Fomblin gave a single broad envelope without resolved peaks.

63312 **Proton transfer and unimolecular decay in the reaction $HCO^+ + CH_3OH \rightarrow CH_3OH_2^+ + CO$.** Moryl, J.E.; Farrar, J.M. (Univ. of Rochester, NY). *Journal of Physical Chemistry;* **86**: No. 11, 2020-2027(27 May 1982).

We report a study of the title reaction over the relative energy range from 0.45 to 3.59 eV. The proton-transfer reaction proceeds in a direct, impulsive manner at all energies with 33 to 70% of the available energy appearing in product translation. Dissociation of the protonated methanol product via CH_3^+ formation or elimination of H_2 to CH_3OH^+ becomes important at higher collision energies. Measurement of the threshold for CH_3^+ production demonstrates that > 90% of the HCO^+ reagents are in the ground vibrational state. Abnormally small product translational energy release for H_2 elimination provides evidence that quantum mechanical tunneling through the exit channel barrier determines the dynamics of this process. Isotopic labeling studies, in which the parent ion CH_3ODH^+ may eliminate H_2 or HD, show that k/sub H_2//k/sub HD/ = 3.0, confirming the role of tunneling in the elimination step.

63313 **Three novel spin-labeled crown ethers.** Eastman, M.P. (Univ. of Texas, El Paso); Patterson, D.E.; Bartsch, R.A.; Liu, Y.; Eller, P.G. *Journal of Physical Chemistry;* **86**: No. 11, 2052-2058(27 May 1982).

The following nitroxide spin-labeled crown ethers have been synthesized: 2,2-(sym-dibenzo-16-crown-5)-4,4-dimethyloxazolidinyl-N-oxyl (1), 2,2-(sym-dibenzo-16-crown-5)-4,4,5,5-tetramethylimidazolinyl-N-oxyl (2), and 3-carboxy-2,2,5,5-tetramethyl-3-pyrrolinyl-l-oxy hydroxy-sym-dibenzo-16-crown-5 ester (3). 1 and 2 are characterized by having the nitroxide near the crown cavity and rigidly bound to a ring carbon atom of the crown. 1-3 have been studied by EPR, and the proton hyperfine splittings have been determined by second harmonic out-of-phase detection. The values obtained for the proton hyperfine splittings of 1 were compared to those determined by ENDOR and found to agree within experimental error. EPR studies of hyperfine splitting constants and Heisenberg spin exchange suggest that these spin-labeled crowns are poor complexing agents for alkali metal cations. The structure of 1 has been determined by x-ray diffraction, and the poor complexing ability of the crown is attributed to an unprecedented structural feature in which the hydrogen atoms of one methylene group of the propylene bridging linkage have turned inward with respect to the cavity of the crown. The proton hyperfine splitting observed for 1 is attributed to protons located at approximately van der Waals distances from the NO group.

63314 **Application of gold-197 Mossbauer spectroscopy to studies of electronic properties of intermetallic, inorganic, and organometallic compounds.** Sham, T.K.; Watson, R.E.; Perlman, M.L. (Brookhaven National Lab., Upton, NY). pp 39-60 of Advances in chemistry series, no. 194. Mossbauer spectroscopy and its chemical applications. Stevens, J.G.; Shenoy, G.K. (eds.). Washington, D.C.; American Chemical Society (1981).

This paper presents and discusses problems in the interpretation of ^{197}Au isomer shifts and quadrupole splittings, and treat the relationship of these parameters to the electronic properties of gold-containing systems. Emphasis is placed on the successful application of the relativistic Hartree-Fock method and a renormalized atom

scheme to calculate $\langle r^{-3} \rangle$ values for the 6p and 5d orbitals of gold. This calculation enables one to visualize, perhaps for the first time, semiquantitative charge distributions in gold compounds. A unified picture of the electronic behavior of the gold valence electrons in various environments emerges.

4004 Electrochemistry

REFER ALSO TO CITATION(S) 62579, 63319

63315 Electrochemical production of H_2O_2 and O_2 at an anthracene/H_2O interface. Pope, M.; Slotnick, K. (New York Univ., NY). *Journal of Physical Chemistry;* **86**: No. 11, 1923-1924(27 May 1982).

The discharge of electrochemically generated holes at an anthracene crystal/water interface produces mainly oxidation products of anthracene. At high current densities (~ 400 $\mu A\ cm^{-2}$), H_2O_2 and O_2 are produced. The efficiency of O_2 production is ~ 3%.

4005 Photochemistry

REFER ALSO TO CITATION(S) 63307, 63323, 63324, 63327

63316 (DOE/ER/10424—2) Electron photoejection in carbanions. Progress report, July 1, 1981-June 30, 1982. Tolbert, L.M. (Kentucky Univ., Lexington (USA). Dept. of Chemistry). 1982. Contract AS05-79ER10424. 120p. NTIS, PC A06/MF A01. Order Number DE82021933.

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The excited states of resonance-stabilized carbanions are powerful reducing species, readily transferring electrons to sulfoxides, haloaromatics, and condensed aromatic hydrocarbons. Their ease of synthesis and propensity for photoejection at visible wavelengths prompts their employment as useful model compounds for fundamental studies in solar photochemistry. We have investigated the details of this electron transfer using a variety of techniques including quantum yields, fluorescence, and wavelength dependent photodisappearance. In particular, we have discovered unusual solvent effects at high concentrations, reflecting a partition between productive photochemical reaction and back electron transfer. On the one hand, an investigation of electron-donor effects gave an inverse correlation with excited state reactivity. On the other hand, excited states which had their donating potential reduced by proper substitution showed a decrease in reactivity. Finally, halo-substituted carbanions underwent ready loss of halogen to give some unique and otherwise inaccessible intermediates.

63317 (LA-UR—82-2430) Photochemistry: past and present. Wampler, F.B. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 8p. (CONF-820949—1). NTIS, PC A02/MF A01. Order Number DE82021892.

From 1. international congress on applications of lasers and electro-optics; Boston, MA, USA (21 Sep 1982).

Photochemistry has been influenced greatly by the application of lasers as excitation sources. Comparisons are made below to illustrate this impact and to show how lasers have revolutionized this research field.

63318 (LA-UR—82-2452) Multiple-photon laser-induced fluorescence. Tiee, J.J.; Ferris, M.J.; Loge, G.W.; Wampler, F.B.; Hartford, A. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 5p. (CONF-820949—2). NTIS, PC A02/MF A01. Order Number DE82021893.

From 1. international congress on applications of lasers and electro-optics; Boston, MA, USA (21 Sep 1982).

The technique of multiple-photon laser-induced fluorescence has been used to study the spectroscopy and dynamics of atoms, molecules, and free radicals. Among the species investigated were iodine atoms (I), carbon monoxide (CO), molecular iodine (I_2), and HS and DS radicals. 7 figures.

63319 Visible-light-induced water cleavage and stabilization of n-type CdS to photocorrosion with surface-attached polypyrrole-catalyst coating. Frank, A.J.; Honda, K. (Solar Energy Research Inst., Golden, CO). *Journal of Physical Chemistry;* **86**: No. 11, 1933-1935(27 May 1982). Contract AC02-77CH00178.

Surface-attached polypyrrole polymer films incorporating a transition-metal catalyst improve markedly the stability of n-type CdS against photocorrosion in aqueous electrolyte while affording the visible-light-assisted water-cleavage reaction. A comparison is made of the oxygen and cadmium production for bare, catalyst-covered, and polypyrrole-catalyst-coated n-type CdS photoanodes.

63320 Picosecond spectroscopic study of chlorophyll-based models for the primary photochemistry of photosynthesis. Bucks, R.R. (Stanford Univ., CA); Netzel, T.L.; Fujita, I.; Boxer, S.G. *Journal of Physical Chemistry;* **86**: No. 11, 1947-1955(27 May 1982).

A series of covalently linked dimers and trimers of chlorophyllide derivatives was investigated by time-resolved absorption and fluorescence spectroscopy (3 to 10^4 ps). For these compounds, the free energy difference between the singlet excited state of the electron donor and the anticipated cation-anion photoproduct (ΔG/sub ET/) is estimated to range from +200 to -400 MeV. For the dimers studied, the singlet-excited-state lifetimes range from 1 to 7 ns and depend inversely on the solvent's static dielectric constant. Since no decrease in lifetime or fluorescence quantum yield was found as ΔG/sub ET/ became more negative, this effect is unlikely to be due to slow electron transfer. It may be a result of fluctuating intramolecular association of the nonpolar macrocycles in solvents with a high dielectric constant. We also studied two trimers, each having the same chlorophyllide a dimer as the electron donor, but with pyropheophorbide a or pheophorbide a as the electron acceptor (the latter is 90 MeV easier to reduce than the former). For the trimer with pheophorbide a as the acceptor, there is evidence for a new path of radiationless decay which may involve an electron-transfer product. However, the rate of formation of this product is slow ($\leqq 10^{10}\ s^{-1}$), and its yield is low ($\leqq$ 50%). Taken together, these results suggest that chlorophyll-based, donor-acceptor pairs connected by flexible chains longer than five atoms are not likely to duplicate the highly efficient excited-singlet-state electron-transfer reactions characteristic of the primary photochemistry of photosynthetic organisms.

63321 Photodecomposition of lead bromochloride film. Chang, S.G.; Dod, R.; Giauque, R.; Novakov, T. (Lawrence Berkeley Lab., CA). *Journal of Physical Chemistry;* **86**: No. 11, 1956-1959(27 May 1982). Contract W-7405-ENG-48.

The molar extinction coefficient as a function of wavelength between 300 and 700 nm can be calculated for PbBrCl from the absorption measurements reported in this paper. Quantum efficiencies of the production of bromine and chlorine during the photodissociation of PbBrCl have been determined at 300, 350, 475, and 525 nm.

63322 Effect of electron scavengers to reduce the ionization current of photoexcited N,N,N',N'-tetramethyl-p-phenylenediamine in nonpolar organic liquids. Lee, K.; Lipsky, S. (Univ. of Minnesota, Minneapolis). *Journal of Physical Chemistry;* **86**: No. 11, 1985-1994(27 May 1982). Contract W-7405-ENG-48.

The effects of perfluoro-n-hexane, perfluoro-n-heptane, perfluoromethylcyclohexane, and perfluorodecalin to reduce the ionization current of photoexcited N,N,N',N'-tetramethyl-p-phenylenediamine (TMPD) have been studied in the solvents tetramethylsilane, 2,2-dimethylbutane (2,2-DMB), isooctane, cyclohexane, n-hexane, and n-pentane. Results are reported over a range of excitation energies from 5.2 to 6.7 eV and, for selected systems, over a temperature range from -78 to 25°C. At quencher concentrations, c/sub q/ ≦ 0.2 M, the ratio of the photocurrent without quencher, J_0, to that with quencher, J, is found to be concave upward, linear, or concave downward in its dependence on c/sub q/, depending on the system studied. At higher c/sub q/, J_0/J is always concave upward. Both J_0 and J increase to about the same extent as the excitation energy increases, thus maintaining J_0/J constant. As the

temperature increases, J increases somewhat more rapidly than does J_0 and increasingly so the larger is c/sub q/. An attempt is made to explain these results with a model based on interaction of the quencher with an epithermal electron.

4006 Radiation Chemistry

REFER ALSO TO CITATION(S) 63314

63323 (DOE/ER/03106—79) Radiation chemistry of hydrocarbon and alkyl halide systems. Progress report, August 1, 1981-July 31, 1982. Hanrahan, R.J. (Florida Univ., Gainesville (USA)). 1982. Contract AS05-76ER03106. 48p. (ORO—3106-79). NTIS, PC A03/MF A01. Order Number DE82021941.

Considerable progress has been made on the four systems proposed for study in the previous Renewal Proposal, including gas phase pulse radiolysis of alkyl iodides; radiolysis of H_2-CO mixtures on catalytic surfaces; photochemistry and mass spectrometry of CF_3 I-CH_3 I mixtures; and the effect of oxygen on gas phase propane radiolysis. Results obtained are described. 16 figures, 3 tables.

63324 (MLM—2959) Electron and photon interactions with $KClO_4$. Moddeman, W.E.; Wang, P.S.; Vogt, B.J.; Testoni, A.L.; Wittberg, T.N. (Mound Facility, Miamisburg, OH (USA)). 15 Sep 1982. Contract AC04-76DP00053. 11p. NTIS, PC A02/MF A01. Order Number DE82022473.

The interaction of $KClO_4$ with electron beam and x-ray photons was examined. From the Auger data, it was found the electrons rapidly decompose $KClO_4$. High resolution x-ray photoelectron spectroscopy (XPS) showed $KClO_4$ to be unstable to nonmonochromatic magnesium and titanium photon sources and stable to monochromatized Al K/sub α/ x-ray radiation. These data are discussed in terms of degradation mechanisms involving: (1) sample heating; and (2) electronic excitations or charge accumulation. 5 figures.

63325 Low-energy crossed-beam study of the proton-transfer reaction $HCO^+ + H_2O \rightarrow H_3O^+ + CO$. Moryl, J.E.; Farrar, J.M. (Univ. of Rochester, NY). *Journal of Physical Chemistry;* **86**: No. 11, 2016-2020(27 May 1982).

We present a crossed-beam study of the title reaction over the relative energy range 0.64 to 4.04 eV. The reactively scattered H_3O^+ products are formed exclusively in a very narrow angular range in the backward direction relative to the incoming HCO^+ projectile. The product translational energy distributions indicate that the fraction of the total available energy appearing in product translation increases from 45% at a collision energy 0.64 eV to 73% at 4.04 eV. We argue that deviations from predictions of the spectator stripping model can be correlated with the HCO^+ reagent state preparation, an argument consistent with our observations on the related $H_3^+ + H_2O$ system [J. Phys. Chem., 85, 1515 (1981)].

63326 Reaction mechanisms for the radiation-induced oxidation and reduction of (dinitrogen)decaamminediruthenium(II). Cabelli, D.E.; Bielski, B.H.J. (Brookhaven National Lab., Upton, NY). *Journal of Physical Chemistry;* **86**: No. 11, 2072-2075(27 May 1982).

The mechanism for the oxidation and reduction of $[Ru(NH_3)_5]_2N_2^{4+}$ by the OH radical and the hydrated electron respectively were determined by use of pulse and ^{60}Co steady-state radiolysis. The binuclear ruthenium complex reacts with the OH radical to form an adduct $[(NH_3)_5Ru/sup\ II/N_2Ru/sup\ II/(NH_3)_5(OH)]^{4+}$ at a rate $k_4 = (2.4 +- 0.3) \times 10^{10}\ M^{-1}\ s^{-1}$ which subsequently changes by a first-order process to $[Ru(NH_3)_5]_2N_2^{5+}$ at a rate $k_5 = (1.4 +- 0.4) \times 10^4\ s^{-1}$. The latter species disappears, also by a first-order reaction, $k_6 = 0.16 +- 0.02\ s^{-1}$, to yield two permanent products, $[Ru/sup\ II/(NH_3)_5N_2]^{2+}$ and $[Ru/sup\ III/(NH_3)_5OH]^{2+}$. The hydrated electron reduces $[Ru(NH_3)_5]_2N_2^{4+}$ to $[Ru(NH_3)_5]_2N_2^{3+}$ at a rate of $k_{11} = (2.1 +- 0.1) \times 10^{10}\ M^{-1}\ s^{-1}$, which subsequently decays by a first-order process at a rate $k_{12} = (8.0 +- 0.4) \times 10^4\ s^{-1}$ to yield $[Ru/sup\ II/(NH_3)_5N_2]^{2+}$ and a number of decomposition products.

63327 Radiation chemistry of xenon trioxide, xenate and perxenate, and photochemistry of perxenate. A pulse radiolysis and laser flash photolysis study. Klaning, U.K. (Aarhus Univ. (Denmark). Kemisk Inst.); Sehested, K. (Risoe National Lab., Roskilde (Denmark)); Wolff, T. (Gesamthochschule Siegen (Germany, F.R.)); Appelman, E.H. (Argonne National Lab., IL (USA)). *Journal of the Chemical Society, Faraday Transactions 1;* **78**: No. 5, 1539-1554(1982).

Unstable species containing xenon in the formal oxidation states five, Xesup(V), and seven, Xesup(VII), were observed by pulse radiolysis of aqueous solutions of xenon trioxide, XeO_3, at pH 8 to 9 and of xenate, $HXeO_4^-$, at pH 11 to 13. Xesup(VII) and species containing xenon in the formal oxidation state nine, Xesup(IX), were observed in pulse radiolysis and flash photolysis of aqueous solutions of perxenate, $HXeO_6^{3-}$, at pH 11 to 13. The formulae $HXeO_3$ and $H_3XeO_7^{2-}$ are assumed for Xesup(V) and Xesup(IX), whereas the observations suggest that Xesup(VII) corresponds to three different species for which the formulae $HXeO_4$, $HXeO_5^{3-}$ and $H_3XeO_8^{2-}$ are assumed. $HXeO_3$ and $H_3XeO_8^{2-}$ are formed in reactions of the hydrated electron with XeO_3 and $HXeO_6^{3-}$, respectively. $HXeO_4$ and $H_3XeO_7^{2-}$ are formed in reactions of the hydroxyl radical with XeO_3 and $HXeO_6^{3-}$ in which the hydroxyl radical adds to a ligand oxygen atom to form peroxy compounds. $HXeO_6^{2-}$ is formed in a reaction with the hydroxyl radical anion in which the hydroxyl radical anion adds to the xenon atom and by photolysis of $HXeO_6^{3-}$. Xesup(V), Xesup(VII) and Xesup(IX) and corresponding iodine species in the oxidation states four, six and eight have similar spectra and kinetics of disappearance.

4007 Radiochemistry And Nuclear Chemistry

REFER ALSO TO CITATION(S) 62779, 63245, 63308

63328 (INP—1069/PL, pp 514-531) Parasitic use of the 72 MeV injection beam for the production of ^{123}I. Willax, H.; Oehninger, H.; Rezzanico, L. (Swiss Institute for Nuclear Research (SIN), Villigen (Switzerland)); Hegedues, F. (Eidgenoessisches Inst. fuer Reaktorforschung, Wuerenlingen (Switzerland)). 1980. NTIS (US Sales Only), PC A23/MF A01.

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

In the SIN acceleration system the beam is transformed from 72 MeV injector cyclotron to the second stage ring cyclotron. Up to 10% of the beam is scrapped of by the slit system of the transfer beam line. This part of the beam is used to produce ^{123}I isotope.

63329 (INP—1069/PL, pp 532-536) Preparation of cyclotron radioisotopes to be used in medicine. Mikulski, J.; Petryna, T. (Institute of Nuclear Physics, Krakow (Poland)). 1980. NTIS (US Sales Only), PC A23/MF A01.

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

In recent years in the Institute of Nuclear Physics in Cracow methods of production and separation of radio-elements using U-120 cyclotron beam were worked out. The targets for irradiation were prepared as metal oxides or salts and also as pure metals. Among others, radioisotopes for cancer diagnostics have been obtained.

63330 (ZfI-Mitt—39, pp 5-19) Application of results from isotope and radiation research in the national economy of the GDR. Leonhardt, J. Jun 1981. (In German). Dep. NTIS (US Sales Only).

From KDT meeting on isotopes for rationalization in industry; Leipzig, German Democratic Republic (4 Jun 1980).

The history of isotope and radiation research applications in the GDR is presented and compared with progress made in other countries. Selected examples are given of methodical development and practical uses, such as the results of research by the ZfI on ionization gas analysis, X-ray fluorescence, radioactive tracer methods, radiochemical methods and the determination of isotopic ratios for studying problems in the fields of hydrology, geology and animal nutrition.

4008 Combustion, Pyrolysis, And High-temperature Chemistry

REFER ALSO TO CITATION(S) 63257

42 ENGINEERING

4201 General Engineering

REFER ALSO TO CITATION(S) 62980

4202 Facilities And Equipment

REFER ALSO TO CITATION(S) 62635, 62638, 62639, 62698, 62699, 62752, 63100, 63220, 63382

63331 **(BMFT-FB-T—82-054) Development of an improved continuously working measuring system with electrical output signal.** Koerber, R.; Saeemann, L. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Apr 1982. 65p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750630.

Subject of research was the possibility of developping an aspiration-type psychrometer for continuous measurement of air humidity with electric output signal. The original aim of adiabatically cooling the measuring sensor to the humid temperature could not be sufficiently realized. The further development was altered in such a way that the most prominent features are now reproducibility of the measuring results and dwell time of the wick. The actual humid temperature or the relative humidity is calculated from the values of the psychrometer by means of an electronic computing circuit. The application range of the psychrometer varies from 5-100°C with a relative humidity of 10-95%.

63332 **(CNEN-RT/FI—81-25) Standard problem exercise on criticality codes for spent-fuel-transport containers.** Mancioppi, S.; Gualdrini, G.F. (Comitato Nazionale per l'Energia Nucleare, Bologna (Italy)). 1981. 55p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE82905929.

Portions of document are illegible.

This report summarizes all the work done by CNEN in the Standard Problem Exercise on Criticality Codes for Spent Fuel Transport Containers as established by the Committee for the Safety of Nuclear Installations. The results have been obtained using the Monte Carlo neutronics Codes Keno-4 (processing the nuclear data with the Gam-Gather-Anisn system), Monk-5 (with the pointwise UKNDL library) and Kim (with its own library, derived mainly by the UKNDL in the fast region and by ENDF/B-4 elsewhere).

63333 **(INER—0447) Studies for using an air-lift as a dosimeter pump in liquid transfer.** Liu, H.F. (Institute of Nuclear Energy Research, Lung-Tan (Taiwan). Technical Information Center). Mar 1982. 26p. (In Chinese). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82906175.

That small quantities of liquid can be pumped successfully with an air lift is shown in this investigation. The pumping rate can be kept within 5% accuracy in this performance test. Air lifts were tested with columns ranging from 1/2 to 2 in. pipe, with water, sodium chloride, and sodium hydroxide solutions with specific gravity of 1, 1.12, and 1.50 respectively. Variables studied were diameter, height and submergence of the columns, density, viscosity and backpressure on the system. Most of the results are presented in graphic and tabular form.

63334 (INP—1066/PL, pp 348-350) **Description of the $PrNi_5$ enhanced nuclear cooling stage in use in Oxford to reach 2 mK and below.** Stone, N.J. (Oxford Univ. (UK). Clarendon Lab.). 1979. Dep. NTIS (US Sales Only).

From 17. Winter School on hyperfine interactions; Bielsko-Biala, Poland (19 Feb - 2 Mar 1979).

$PrNi_5$ refrigerator is described. It has been cooled to 2mK. Over a period of about 6n it returned to 10mK. This system is still being developed.

63335 (KFK—3228, pp 197-228) **Remote handling systems.** Koehler, G.W. Nov 1981. NTIS (US Sales Only), PC A12/MF A01.

From Workshop on high intensity accelerators and compressor rings; Karlsruhe, F.R. Germany (25 Jun 1981).

In this paper I deal above all with questions of remote handling since in this field in particular new problems must be solved.

63336 **(SAND—82-1904C) Safe use of wire rope at a national laboratory.** Stinnett, L. (Sandia National Labs., Albuquerque, NM (USA)). Aug 1982. Contract AC04-76DP00789. 4p. (CONF-821113—1). NTIS, PC A02/MF A01. Order Number DE82020561.

From 4. annual Crane conference; Las Vegas, NV, USA (19 Nov 1982).

The safety of wire-rope cables used in hoists and cranes for heavy equipment handling at the Sandia National Laboratories, one experience with cable failure, and the inspection and servicing procedures used as safety precautions when dealing with wire rope are discussed. (LCL)

63337 **(TAC-HP—82-003) Heat pipe technology: a bibliography with abstracts. Quarterly update, July-September 1982.** Srinivasan, R. (ed.). (New Mexico Univ., Albuquerque (USA). Technology Application Center). Sep 1982. 39p. University of New Mexico, Technology Application Center, Albuquerque, NM 87131.

A bibliography containing 60 citations of publications on heat pipe uses, theory, design, fabrication, performance, and testing is presented. An author index is included. (LCL)

63338 **(UCID—19433) Apparatus for large-scale cable fire experiments.** Staggs, K.J. (Lawrence Livermore National Lab., CA (USA)). 20 Jul 1982. Contract W-7405-ENG-48. 11p. NTIS, PC A02/MF A01. Order Number DE83000659.

The design and fabrication of an apparatus for the performance of large-scale fire experiments on vertical cable arrays are described. On the basis of field surveys and previous experiments, the decision was made to use a vertical cable run with opposing horizontal runs at the top and bottom. To minimize interference with the burning process, and effort was made to keep the mass surrounding and supporting the cable specimens to a minimum. In order to accommodate these requirements and provide a means of measuring mass loss, a support apparatus had to be designed and fabricated. This apparatus was found to be a simple, reliable, and effective means of supporting the cables while minimizing the amount of mass surrounding them.

63339 **Review of removable surface contamination on radioactive materials tranportation containers.** Kennedy, W.E. Jr.; Murphy, D.W.; Watson, E.C. (PNL, Richland, WA 99352). *Transactions of the American Nuclear Society;* **39**: 78-79(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63340 **Current status of the HFEF data acquisition and process control system.** Chesnovar, D.L.; Just, F.H.; Lau, L.D.; Phipps, R.D.; Randall, P.F. (ANL-Idaho, Idaho Falls, ID 83401). *Transactions of the American Nuclear Society;* **39**: 966-968(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63341 **ANSI/ANS-8.3-1979-American national standard criticality accident alarm system.** Smith, D.R. (LANL, Los Alamos, NM 87545). *Transactions of the American Nuclear Society;* **39**: 545(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63342 **Safety in conducting subcritical neutron-multiplication measurements in situ-ANS-8.6.** Paxton, H.C. (LANL, Los Alamos, NM 87545). *Transactions of the American Nuclear Society;* **39**: 546-547(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63343 **ANSI/ANS 8.9-1978-criticality safety pipe intersection standard review and applications.** Hopper, C.M. (Union Carbide, Nucl Div, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **39**: 547(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63344 **Nuclear criticality safety in shielded facilities-ANS-8.10.** Gore, B.F. (PNL, Richland, WA 99352). *Transactions of the American Nuclear Society;* **39**: 548(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63345 **Criticality control of special actinide elements-ANS-8.15.** Bigelow, J.E.; Hansen, G.E. (ORNL, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **39**: 550-551(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63346 **The need for radiation field measurements from a low-enriched critical assembly.** Whitesides, G.E. (ORNL, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **39**: 554(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63347 **Function and characteristics of criticality accident alarm systems.** Smith, D.R. (LANL, Los Alamos, NM 87545). *Transactions of the American Nuclear Society;* **39**: 554-555(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63348 **Facility description of a solution critical assembly; SHEBA.** Forehand, H.M. Jr.; Malenfant, R.E. (LANL, Los Alamos, NM 87545). *Transactions of the American Nuclear Society;* **39**: 555-557(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63349 **Neutron and Gamma-ray spectrum measurements at the Los Alamos critical assembly SHEBA.** Griffith, R.V.; Rueppel, D.W.; Thorngate, J.H. (LLNL, Livermore, CA 94550). *Transactions of the American Nuclear Society;* **39**: 557-559(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63350 **Neutron and Gamma-ray dose measurements at the Los Alamos critical assembly SHEBA.** Hankins, D.E. (LLNL, Livermore, CA 94550). *Transactions of the American Nuclear Society;* **39**: 559-561(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63351 **Study of some current technologies for criticality alarm systems.** Pruvost, N.L.; Tsitouras, J.C. (LLNL, Livermore, CA 94550). *Transactions of the American Nuclear Society;* **39**: 561-562(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63352 **Shielding and criticality analyses for light-weight air-transportable accident-resistant container.** Andersen, J.A.; Dupree, S.A.; Hong, K.J. (Sandia, Albuquerque, NM 87185). *Transactions of the American Nuclear Society;* **39**: 763-764(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

4203 Lasers

REFER ALSO TO CITATION(S) 63460

63353 (CERN—82-01, pp 247-249) **Nd:YAG laser for holography.** Bykovsky, Yu.A.; Evtihiev, N.N.; Larkin, A.I. (Moskovskij Gosudarstvennyj Univ. (USSR)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

Different possibilities to use photonics, holography and optical processing for nuclear physics has been investigated in our works. The paper presents the results of the study of time and spatial coherence of Nd:YAG laser and application in holography.

63354 **(LA-UR—82-2424) Compact resistively stablized excimer laser for injection- and mode-locking applications.** Sze, R.C. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 7p. (CONF-820947—1). NTIS, PC A02/MF A01. Order Number DE82021885.

From 4. international symposium on gas flow and chemical lasers; Stresa, Italy (13 Sep 1982).

A miniature, resistively-stabilized excimer laser has been developed. The laser has 86 separately stabilized discharges within a length of only 27.6 cm, which allows for a total cavity length of only 33 cm. Presently, with a 2.5-mm electrode separation, we have obtained over 1 mJ per pulse energy in XeCl and the laser has been operated over 70 Hz without gas flow. Pulse lengths as long as 40 ns full-width at half-maximum intensity and over 80 ns total lasing time has been observed. The beam divergence is measured at three times the diffraction limit. This laser is expected to be uniquely suited for injection-locking and mode-locking applications.

63355 **(LA-UR—82-2425) Compact 75-watt CO_2 laser at 750 hertz.** Sze, R.C. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 6p. (CONF-820947—2). NTIS, PC A02/MF A01. Order Number DE82021889.

From 4. international symposium on gas flow and chemical lasers; Stresa, Italy (13 Sep 1982).

Portions of document are illegible.

We describe the operation of a compact CO_2 laser that operates to 750 Hz at 100 mJ/pulse in the TEM/sub oo/ mode. The device is line and power tunable ranging from milliwatts to 75-W average power.

4204 Heat Transfer And Fluid Flow

REFER ALSO TO CITATION(S) 63014, 63044, 63077, 63466

63356 **(BMFT-FB-T—82-041) Basic measurements on a multiple heat pipe.** Rohner, P.; Schippl, K. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Apr 1982. 43p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750632.

A multiple heat pipe is a specially formed long heat pipe, which fulfills the function of several single heat pipes. The suitability of this arrangement for a heat exchanger was investigated. Several laboratory models were manufactured from corrugated tubes and their behaviour was measured. It was shown that the serpentine model exhibits the expected heat exchange properties. When subject to severe operating conditions, the pipes remain operational, although somewhat limited in performance. It was determined that the results were a function of the nature of the exchange media (air-air, air-water, water-water). This corrugated heat pipe design

shows good promis for successful further development into an air-air heat exchanger.

63357 **(DOE/PC/40280—T5) Parametric performance studies on fluidized-bed heat exchangers. Task I. Fouling characteristics. Yearly technical progress report, 28 July 1981-31 July 1982.** (United Technologies Research Center, East Hartford, CT (USA)). Sep 1982. Contract AC22-81PC40280. 23p. NTIS, PC A02/MF A01. Order Number DE82021005.

Portions of document are illegible.

Analyses and experiments are being performed in this program to investigate the heat transfer performance of single and multi-stage shallow fluidized beds for application to the recovery of heat from sources such as waste heat, and coal combustion or coal gasification. The work, which is an extension of that done previously under contracts EC-77-C-03-1433 and DE-AC03-79-ET11348, consists of three tasks. In Task 1, tests have been conducted to investigate the effects of liquid condensate fouling on fluidized bed heat exchanger performance. Liquid condensates used in these tests were water and glycerol (which is more viscous than water). The tests showed that fluidized bed heat exchanger performance is degraded by condensation within the bed and the degradation is caused by bed particles adhering to the heat exchanger surface, not by particle agglomeration. Liquid condensate did not continuously build up within the bed. After a period of dry-out, heat transfer equal to that obtained prior to condensation was again obtained. 8 figures, 1 table.

63358 **(SAND—82-1977C) Effective stress principle for partially saturated granular media.** McTigue, D.F.; Wilson, R.K.; Nunziato, J.W. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 31p. (CONF-820843—2). NTIS, PC A03/MF A01. Order Number DE82020408.

From US-Japan seminar on new models and constitutive relations in the mechanics of granular materials; Ithaca, NY, USA (22 Aug 1982).

A granular or porous medium with any number of fluid phases in the pores is considered. The motivation stems primarily from concern for the fluid flow and matrix deformation in partially saturated media, a typical example being a soil or rock containing interstitial water and air. The heart of the following developments lies in the choice of constitutive equations for the forces of interaction between the various components of the mixture. Thermodynamic arguments are used to motivate the form of the interaction terms. As a result, a concept of effective stress emerges which agrees with previously proposed models and capillary effects are identified clearly in a thermodynamic context. The resulting theory is illustrated by examining some simple problems in partially saturated media. First, we specialize to the case of a linear elastic matrix, and show how capillary suction reduces the porosity. Second, we consider the problem of one-dimensional consolidation of a partially saturated half-space in which the air is free to escape. The problem for the fluid pressure reduces to a nonlinear diffusion problem, similar to that for horizontal infiltration, with a saturation front propagating downward into the medium. No water drains through the surface. The results for the fluid pressure also indicate that the granular medium undergoes larger elastic deformation than in the saturated case. We also comment briefly on the effects of porosity gradients on consolidation.

4205 Materials Testing

63359 **(LA-UR—82-2417) Limited-angle CT reconstruction using a priori information.** Hanson, K.M. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 8p. (CONF-821029—1). NTIS, PC A02/MF A01. Order Number DE82021884.

From IEEE Computer Society international symposium on medical imaging and image interpretation; Berlin, F.R. Germany (26 Oct 1982).

Projection data that are limited in number and range of viewing angle cannot completely specify an arbitrary source function. In the space of all permissible functions there exists a null subspace about which the projection measurements provide no information. Deterministic reconstruction algorithms usually set the null space contributions to zero leading to severe reconstruction artifacts. A Fit And Iterative Reconstruction (FAIR) method is proposed that incorporates a priori knowledge of the approximate functional form of the source. In FAIR the parameters of this functional model are determined from the available projection data by a weighted fitting procedure. The resulting distribution is then iteratively revised to bring the final estimate into agreement with the measured projections using a standard algorithm such as ART.

63360 **(NP—2904393) Improvement of acoustic emission receivers with respect to radio location and analysis, H.D. Steffens, Dortmund Univ.** Crostack, H.A.; Walder, K.F. (Dortmund Univ. (Germany, F.R.). Abt. Maschinenbau). Oct 1979. 31p. (IN German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82904393.

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A description is given of a testing head made of piezoceramic materials which exhibits a band range of 0.6 to 4 MHz and a sensitivity only slightly below that of a resonance transformer. Diagrams illustrate the design of the ROW test head and its frequency spectrum. 14 references, 22 figures.

63361 **(NP—2904683) Methods of the mathematical treatment of the reflection of ultrasonic waves at crack-like flaws, German Federal Testing Institute (BAM), Berlin.** Haufe, U.; Wuestenberg, H.; Erhard, A. (Bundesanstalt fuer Materialpruefung, Berlin (Germany, F.R.)). 1981. 81p. (IN German). Bundesanstalt fuer Materialpruefung.

Mathematical equations are formulated to describe deformities in elastic media for which detailed theoretical associations are developed with respect to wave propagation, reflection, and diffraction. 30 references, 22 figures.

4206 Safety Engineering

REFER ALSO TO CITATION(S) 63336

4208 Electronic Circuits And Devices

REFER ALSO TO CITATION(S) 63222, 63458

63362 **(BDX—613-2834) Shelf-life characterization of adhesives. Final report.** Tira, J.S. (Bendix Corp., Kansas City, MO (USA)). Sep 1982. Contract AC04-76DP00613. 24p. NTIS, PC A02/MF A01. Order Number DE82021306.

Differential scanning calorimetry and thermal mechanical analysis were used to evaluate the shelf life and storage condition characteristics of several epoxy film adhesives used in electronic applications.

63363 **(SAND—82-1353C) Performance surfaces of adaptive predictor structures.** Etter, D.M.; Stearns, S.D. (Sandia National Labs., Albuquerque, NM (USA); New Mexico Univ., Albuquerque (USA). Dept. of Electrical Engineering). 1982. Contract AC04-76DP00789. 8p. (CONF-821105—2). NTIS, PC A02/MF A01. Order Number DE82020090.

From Asilomar conference; Pacific Grove, CA, USA (8 Nov 1982).

The performance surface of an adaptive filter is determined by the filter structure and input signal conditions, but not by the adaptive algorithm. In this paper we examine and illustrate the performance surfaces of various adaptive predictor structures, including FIR, IIR, and lattice predictors. By comparing the performance surfaces, we draw conclusions about the relative abilities of the different structures to converge and to track changing signal conditions.

63364 **(UCRL—53303) Physical modeling of avalanche-transistor switching.** Koo, J.C.; Pocha, M.D. (Lawrence Livermore National Lab., CA (USA)). 12 Aug 1982. Contract W-7405-ENG-48. 9p. NTIS, PC A02/MF A01. Order Number DE83000339.

By using a simple, one-dimensional model, we argue that the phenomenon of second breakdown in an avalanche transistor arises due to the collapse of the internal electric field. This, we propose, is a result of an expanding plasma wave.

63365 **733 as a low-input-impedance preamplifier for current-division use.** Gottschalk, B. (Stanford Linear Accelerator Center, CA (USA)). *Nuclear Instruments and Methods in Physics Research;* **196**: No. 2/3, 447-448(15 May 1982).

By grounding the usual inputs of a 733 amplifier chip and driving one of the gain-control pins, a common-base input stage can be obtained with an input impedance of about 20 Ω. This can be used as an inexpensive current-division preamp and, in large multichannel systems, will probably not limit the performance.

63366 **High-power radio-frequency attenuation device.** Kerns, Q.A.; Miller, H.W. (to Dept. of Energy). US Patent Application 335,996. 30 Dec 1981. 25p. Contract AC02-76CH03000.

Portions of document are illegible.

A resistor device for attenuating radio frequency power includes a radio frequency conductor connected to a series of fins formed of high relative magnetic permeability material. The fins are dimensional to accommodate the skin depth of the current conduction therethrough, as well as an inner heat conducting portion where current does not travel. Thermal connections for air or water cooling are provided for the inner heat conducting portions of each fin. Also disclosed is a resistor device to selectively alternate unwanted radio frequency energy in a resonant cavity.

4209 Waste Processing Plants And Equipment

REFER ALSO TO CITATION(S) 63202, 63203, 63204, 63205, 63477

4210 Combustion Systems

REFER ALSO TO CITATION(S) 62856, 62858, 62861, 62961, 62964, 62979, 63170

63367 **(BMFT-FB-T—82-056) Coal firing of process heaters.** Balthasar, W.; Schoedel, J.; Ruggieri, R.; Rijnsoever, J. van. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Apr 1982. 64p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750631.

1. Coal firing has been a standard practice some decades ago. With the advent of coal use again coal firing of modern process furnaces should be studied, since coal firing of boilers has had significant developments during this time. 2. Goal of the study was to design process heaters for coal firing and compare the result with oil fired units. 3. Typical furnaces with oil firing which had been recently built were used as design and comparison basis. 4. Result of the study is that furnaces can be built with coal firing under various design philosophies, but all of them result in a more expensive furnace than for oil firing. All these analyses do not even include coal storage, grinding and feed as well as dust collection and flue gas treatment. 5. Coal firing of process furnaces is far too expensive.

63368 **(DOE/MC/16050—1197) Design and performance of a capacitance probe for monitoring averaged parameters and individual events in a high-temperature, fluidized-bed reactor.** Fasching, G.E.; Goff, D.R.; Maxfield, D.A. (TRW Energy Engineering Div., Morgantown, WV (USA)). Jul 1982. Contract AC21-81MC16050. 48p. NTIS, PC A03/MF A01. Order Number DE82020148.

Portions of document are illegible.

Improved instrumentation is needed both for operation of and research into the mechanics of fluidized beds. The capacitance probe described in this report has the capability of measuring overall bed parameters such as height and density on a time-averaged basis as well as high-speed measurements that can yield insight into the details of the fluidized bed itself. This segmented probe uses guarded electrodes to control the portion of the bed that the active segment is sensitive to and high-frequency excitation to improve the ratio of capacitive to resistive current. Phase-angle detection is used to cancel the resistive component of the detector current and to separate the capacitive component. The high-speed data is processed along with sample data showing some of the potential measurements that can be made in fluidized beds.

63369 **(EPRI-RD—2369-SR, pp 2.1-2.27) Low emission premix twin reversal gas turbine combustor.** McKnight, D.; Taylor, R.J. (Rolls-Royce Ltd., Coventry, England). May 1982. NTIS, PC A99/MF A01.

From 2. conference on advanced materials for alternative fuel capable heat engines; Monterey, CA, USA (24 Aug 1981).

The combined impact of energy conservation and air pollution control has lead to the use of high pressure ratio fuel efficient gas turbines capable of burning a wide range of fossil fuels. High pressure operation, fuel tolerance and clean exhaust requirements have placed more stringent conditions on conventional gas turbine combustion systems and has promoted a requirement for innovative response. This paper describes a combustion system which has been successfully used in a range of sizes for lightweight gas turbines, the principle features involving a novel aerodynamic fuel injection system combined with a vortex controlled twin reversal primary zone. The resultant performance has shown a significant improvement in exhaust emission levels while maintaining a wide degree of fuel tolerance. While it is admitted that this system does not provide a complete solution to low emission fuel tolerance targets than some of the more sophisticated concepts being developed, it does represent a major step forward in offering a viable, cost effective design with full production engine commitment.

4240 Pollution Control Equipment

REFER ALSO TO CITATION(S) 63369

43 PARTICLE ACCELERATORS

4301 Design, Development, And Operation

REFER ALSO TO CITATION(S) 63646, 63825

63370 **(KFK—3228, pp 123-142) Operating experience with the meson factories.** Macek, R.J. Nov 1981. NTIS (US Sales Only), PC A12/MF A01.

From Workshop on high intensity accelerators and compressor rings; Karlsruhe, F.R. Germany (25 Jun 1981).

I discuss three operating facilities that meet these criteria, namely LAMPF, SIN and TRIUMF. They are mature facilities that have essentially met or exceeded design goals, are now working reliably, and have active, multifaceted research programs in basic and applied physics. While no really major surprises were encountered in their construction and operation to date, much has been learned from the experience with these machines. They represent a great deal of progress in high intensity accelerator science and technology.

63371 **(KFK—3228, pp 143-148) Status of the New England nuclear 45 MeV proton linac.** Jule, W.E. Nov 1981. NTIS (US Sales Only), PC A12/MF A01.

From Workshop on high intensity accelerators and compressor rings; Karlsruhe, F.R. Germany (25 Jun 1981).

One of the main product lines of New EnglNuclear (NEN) is radioisotopes for diagnostic nuclear medicine. These isotopes are presently produced on cyclotrons at NEN. In order to meet the production requirements for these short lived (3 day half-life) isotopes, NEN decided in 1977 to build a high current (5mA average), 45 MeV proton linear accelerator. By June 1978 we had assembled the core team and began the design of the machine. The building design had begun, with the aid of consultants, in February 1978.

We are presently nearing completion of the accelerator with first beam scheduled for late fall of 1981. This paper will briefly describe each major subsystem and discuss its status.

63372 (KFK—3228, pp 149-158) **Accelerator development work at CRNL.** Chidley, B.G. Nov 1981. NTIS (US Sales Only), PC A12/MF A01.

From Workshop on high intensity accelerators and compressor rings; Karlsruhe, F.R. Germany (25 Jun 1981).

This paper describes the accelerator development program at CRNL in support of the long range accelerator breeder program. Development work is discussed which will lead to the construction of 'ZEBRA' a Zero Energy Breeder Accelerator which will produce 300 mA of proton at 10 MeV.

4302 Beam Dynamics, Field Calculations, And Ion Optics

REFER ALSO TO CITATION(S) 63405

63373 (INP—1069/PL, pp 237-256) **Spatial distributions of magnetic field in automatic isochronous cyclotron AIC-144.** Schwabe, E.; Gabanska, B.; Ciempka, J.; Dabrowska, I.; Starzewski, E. (Institute of Nuclear Physics, Krakow (Poland)). 1980. (In Russian). NTIS (US Sales Only), PC A23/MF A01.

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

The forming of the spatial distribution of magnetic field in new Cracow isochronous cyclotron AIC-144 is described. The correction of magnetic field is performed with the help of the ferromagnetic elements and current coils. The difference between calculated and measured values of magnetic fields is not higher than 0.5-1.5 per cent.

63374 (INP—1069/PL, pp 257-266) **Calculation of electromagnet with different pole form.** Alenitskij, Yu.G.; Zaplatin, N.L. (Joint Inst. for Nuclear Research, Dubna (USSR)). 1980. (In Russian). NTIS (US Sales Only), PC A23/MF A01.

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

The main feature of isochronous cyclotron is the range of energies of accelerated particles. The range of accessible energies depends to a great extent on the shape of magnet poles. The results of magnetic field calculations in the U-120 M isochronous cyclotron are presented.

63375 (INP—1069/PL, pp 336-347) **System of beam formation in 240-cm isochronous cyclotron.** Belyakov, V.A.; Litunovskij, P.N.; Minyaer, O.A. (Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (USSR)). 1980. (In Russian). NTIS (US Sales Only), PC A23/MF A01.

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

Coefficient of beam extraction depends, in the great extent, on the beam emittance. The emittance of the beam after acceleration is much higher than emittance of beam injected to cyclotron. Causes of beam emittance increase are discussed and methods of lowering beam dispersion are proposed.

63376 (INP—1069/PL, pp 419-431) **Automatic system for stationary magnetic field topography measurement.** Anosov, V.N.; Gavrish, P.P.; Gorodnichev, E.D.; Kol'ga, V.V.; Shishlyannikova, Z.N. (Joint Inst. for Nuclear Research, Dubna (USSR)). 1980. (In Russian). NTIS (US Sales Only), PC A23/MF A01.

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

Automatic system for cyclotron magnetic field measurement is described. Magnetic field is measured using the Hall effect. Electric circuits for measurement control and acquisition of the obtained data are presented.

63377 (INP—1069/PL, pp 457-464) **Measurement of time characteristics of ion beam in 240 cm isochronous cyclotron.** Vaganov, A.K.; Vasil'ev, V.S.; Gordin, V.I.; Litunovskij, P.N. (Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (USSR)). 1980. (In Russian). NTIS (US Sales Only), PC A23/MF A01.

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

Isochronous cyclotron in Kiev is used for time of flight experiments with high energy neutrons. The time spread of the beam pulse and phase shift between beam pulse and acceleration tension are meaningful parameters of accelerator. Methods of measurement of phase shift and time phase spread of beam pulses are presented. The system of automatic phase shift control is described.

63378 (ITF—82-55P) **Collective acceleration of ions by power relativistic electron streams.** Petrenko, V.N.; Chernousenko, V.M. (AN Ukrainskoj SSR, Kiev. Inst. Teoreticheskoj Fiziki). Jun 1982. 58p. (In Russian). Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR.

Portions of document are illegible.

A series of models of the ion collective acceleration by power relativistic electron streams are considered. Theoretical calculations are compared with available experimental results. The applicability region of each of the considered models is pointed out. Radial oscillations in forceless relativistic electron streams are investigated within the framework of the perturbation theory.

63379 (KFK—3228, pp 33-43) **SNQ compressor ring IKOR.** Reich, K.H. Nov 1981. NTIS (US Sales Only), PC A12/MF A01.

From Workshop on high intensity accelerators and compressor rings; Karlsruhe, F.R. Germany (25 Jun 1981).

A one-year study and a machine experiment at the CERN PS have shown how isochronous operation of an otherwise classical AG compressor ring would lead to the absence of an RF system and to rise times of longitudinal instability modes an order of magnitude longer than the ring filling time. Further studies aimed at making this attractive approach fully transparent are pointed out.

63380 (KFK—3228, pp 45-56) **SNQ linear accelerator beam dynamics.** Mittag, K. Nov 1981. NTIS (US Sales Only), PC A12/MF A01.

From Workshop on high intensity accelerators and compressor rings; Karlsruhe, F.R. Germany (25 Jun 1981).

The main arguments leading to the SNQ linear accelerator parameters are summarized. Relatively low rf frequencies were chosen mainly because of availability and cost minimization of rf power sources. The beam dynamics is discussed as to its relevance with respect to beam spill. Special parameter choices and measures leading to minimal beam spill are outlined.

63381 (LA—9455-MS) **Some thoughts on the LAMPF II lattice.** Thiessen, H.A. (Los Alamos National Lab., NM (USA)). Aug 1982. Contract W-7405-ENG-36. 20p. NTIS, PC A02/MF A01. Order Number DE82021258.

The lattice proposal of Rees and Copper is discussed. It is shown that dispersion-free straight sections result if the appropriate symmetry is observed within each group of bends. The increase of dispersion in the straight sections is investigated for a lattice with nominal dispersion-free straight sections in which the phase shift per cell is tuned slightly to avoid resonances. A method of tuning the transition energy without changing nu in such a lattice is also investigated. An alternative to the Rees and Cooper lattice is proposed. This lattice is of the FOFODODO type, has six long straight sections, and will permit 32 GeV to be obtained in the same circumference as the Rees and Cooper lattice. The proposed design offers reasonable hope that our specification of l-ns time definition in the extracted beam will be met. We note with caution that the suggested lattice has some controversial features. Included are a transition energy of 5 GeV and 16-kG field in the bending magnets. This proposal is intended as a stimulus for further discussion, not as a final design.

63382 **Harmonic measurements in superconducting magnets for a high energy accelerator.** Wake, M. (KEK National Lab. for High Energy Physics, Ibaraki (Japan)); Gross, D.A.; Yamada, R. (Fermi National Accelerator Lab., Batavia, IL (USA)). *Cryogenics;* 21: No. 6, 341-344(Jun 1981).

For the multipole field measurement in superconducting magnets for an accelerator application, a practical method was successfully introduced. The method uses a slow rotating coil assembly with an integator and a shaft encoder connected to a computer system. The accuracy and the quickness of the measurement was sufficient for the mass production test of the Fermilab Energy Doubler magnets.

4303 Auxiliaries And Components

REFER ALSO TO CITATION(S) 62800, 63328, 63329, 63366, 63370, 63404, 63451

63383 (INP—1069/PL, pp 327-335) **Diagnostics of the ion beam of isochronous cyclotron in Institute of Nuclear Physics in Alma-Ata.** Arzumanov, A.A.; Batishchev, V.N.; Berger, V.D.; Voronin, A.M.; Gor'kovets, M.S.; Nigmatov, M.Kh. (AN Kazakhskoj SSR, Alma-Ata. Inst. Yadernoj Fiziki). 1980. (In Russian). NTIS (US Sales Only), PC A23/MF A01.

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

The methods of beam monitoring used in Kazakhstan isochronous cyclotron are described. Diagnostics of the beam provides information for cyclotron parameter control. Measurements of intensity, position and profile of the beam are performed using different kinds of probes like: scintillation materials, Faraday cups and capacity coupling detectors.

63384 (INP—1069/PL, pp 358-361) **Preparation of the analysing magnet for isochronous cyclotron of Institute of Nuclear Physics in Rez.** Bejshovets, V.; Grda, A.; Kuzmiak, M.; Trejbal, Z. (Ceskoslovenska Akademie Ved, Rez. Ustav Jaderne Fyziky). 1980. (In Russian). NTIS (US Sales Only), PC A23/MF A01.

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

The dispersion parameters of beam obtained from isochronous cyclotron are investigated. The aim of this study is preparation of the analysing magnet for improvement of energy resolution of cyclotron beam.

63385 (INP—1069/PL, pp 362-371) **System of beam transport and analysis of 103-cm cyclotron in Aabo Academy in Turku.** Basargin, Yu.G.; Gal'chuk, A.V.; Korolev, L.E.; Stepanov, A.V. (Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (USSR)). 1980. (In Russian). NTIS (US Sales Only), PC A23/MF A01.

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

System of beam transport and analysis of 103-cm cyclotron installed at A.B.O. Academy in Turku is described. The main characteristics of the system are discussed. Analysing magnet installed at two cyclotron permits to obtain beams with small energy spread.

63386 (INP—1069/PL, pp 395-418) **Control system of U-120 M cyclotron.** Akkuratov, V.A.; Glazov, A.A.; Kochkin, V.A.; Kudryashov, V.V.; Semenov, M.M.; Starzhevskij, E.; Shakun, N.G.; Yun Kho Zin (Joint Inst. for Nuclear Research, Dubna (USSR)). 1980. (In Russian). NTIS (US Sales Only), PC A23/MF A01.

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

The automatic control systems of isochronous cyclotron U-120 M are described. The schemes of electric control circuits are given. Radio frequency system and ion source in Dubna cyclotron are controlled automatically.

63387 (INP—1069/PL, pp 432-438) **Multiple-charge ion source for U-400 isochronous cyclotron.** Pasyuk, A.S.; Kutner, V.B.; Tret'yakov, Yu.P. (Joint Inst. for Nuclear Research, Dubna (USSR)). 1980. (In Russian). NTIS (US Sales Only), PC A23/MF A01.

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

Characteristics of gas ion source for Dubna U-400 cyclotron are described. The xenon ions with 15 electron charges have been obtained with the intensity of 10 microampers in the pulse. The further development of the source is discussed.

63388 (INP—1069/PL, pp 439-456) **High-frequency system of 103-sm isochronous cyclotron.** Bogdanov, P.V.; Davydov, M.S.; Kassirov, V.A.; Malyshev, I.F.; Mudrolyubov, V.G.; Stepanov, A.V.; Finkel'shteji, I.I. (Nauchno-Issledovatel'skij Inst. Ehlektrofizicheskoj Apparatury, Leningrad (USSR)). 1980. (In Russian). NTIS (US Sales Only), PC A23/MF A01.

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

Radio high-frequency system of 103-cm isochronous cyclotron is described. Main stress is put on the reliability, simplicity and compactness of the system. Block schemes of electric circuits are given.

63389 (INP—1069/PL, pp 476-481) **Programs for control system of U-120 M cyclotron.** Chigak, M. (Ceskoslovenska Akademie Ved, Rez. Ustav Jaderne Fyziky). 1980. (In Russian). NTIS (US Sales Only), PC A23/MF A01.

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

Programs for computer control of U-120 M isochronous cyclotron are presented. The most meaningful problem is the phase of beam pulse during passing through the acceleration sector. The programs are used to optimization of currents in correction coils for different final beam energies.

63390 **(Juel-Conf—45) ICANS-V: Proceedings of the 5th meeting of the International Collaboration on Advanced Neutron Sources.** Bauer, G.S.; Filges, D. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.)). Oct 1981. 674p. Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe, Germany, F.R.

From 5th meeting of the International Collaboration on Advanced Neutron Sources; Juelich, Germany, F.R. (22 - 26 Jun 1981).

These proceedings contain the articles and contributed papers presented at the named meeting. These concern spallation neutron sources including their applications. Separated abstracts were prepared for the papers in this report.

63391 (KFK—3228, pp 63-74) **Proton induction linacs as high-intensity neutron sources.** Keefe, D.; Hoyer, E. Nov 1981. NTIS (US Sales Only), PC A12/MF A01.

From Workshop on high intensity accelerators and compressor rings; Karlsruhe, F.R. Germany (25 Jun 1981).

Proton induction linacs are explored as high intensity neutron sources. The induction linac - concept, properties, experience with electrons, and possibilities - and its limitations for accelerating ions are reviewed. A number of proton induction linac designs are examined with the LIACEP program and general conclusions are given. Results suggest that a proton induction accelerator of the lowest voltage, consistent with good neutron flux, is preferred and could well be cost competitive with the usual rf linac/storage ring designs.

63392 (KFK—3228, pp 75-78) **Foils for negative ion charge-exchange injection.** Planner, C.W. Nov 1981. NTIS (US Sales Only), PC A12/MF A01.

From Workshop on high intensity accelerators and compressor rings; Karlsruhe, F.R. Germany (25 Jun 1981).

Thin foils, gas and liquid jets and lasers have been proposed as possible stripping systems. Thin foils are being used successfully

in negative ion charge-exchange injection systems and appear to be the simplest practical system.

63393 (KFK—3228, pp 79-100) **Rapid beam switching techniques.** Schaffer, G. Nov 1981. NTIS (US Sales Only), PC A12/MF A01.

From Workshop on high intensity accelerators and compressor rings; Karlsruhe, F.R. Germany (25 Jun 1981).

The report gives a survey on rapid beam switching techniques as they are required for the SNQ project. This includes formation and repartition of the 1.1 GeV linac macropulses for various targets, and ejection from the isochronous compressor ring IKOR. The design of fast kicker magnets and of fast beam choppers required for these purposes is treated in some detail.

63394 (KFK—3228, pp 101-110) **RF power system for SNQ.** Hochschild, G. Nov 1981. NTIS (US Sales Only), PC A12/MF A01.

From Workshop on high intensity accelerators and compressor rings; Karlsruhe, F.R. Germany (25 Jun 1981).

The SNQ linear accelerator consists of the alvarez part (up to 105 MeV) operated at 108 MHz and the disk-and-washer part (105-1100 MeV) operated at 324 MHz. The requirements for the appropriate rf system are summarized. The most stringent design parameters are the high pulse power demand and the close rf field tolerances.

63395 (KFK—3228, pp 111-122) **New methods of RF-control for the SNQ.** Schulze, D. Nov 1981. NTIS (US Sales Only), PC A12/MF A01.

From Workshop on high intensity accelerators and compressor rings; Karlsruhe, F.R. Germany (25 Jun 1981).

The Karlsruhe- Spallations- Source SNQ with 100 mA beam current and 100 Hz repetition rate demands a better rf control accuracy compared with operating proton linear accelerators. Two new methods have been investigated. The first method applies a phase step during turn-on, which can lead to a shorter filling time and a better efficiency of the pulsed power transfer. The second method uses a computer model of the amplitude and phase control system for an automatic adjustment of the feedforward beam compensation pulse. Thereby, the amplitude and the phase control error due to beam transients are reduced and stabilized against long-term parameter fluctuations. This is important for low particle losses. It is possible to achieve and maintain a field error of +-0.1% and +-0.1° in the worst case of a sharp pulsed beam.

63396 (KFK—3228, pp 159-195) **Radiation problems expected for the German spallation neutron source.** Goebel, K. Nov 1981. NTIS (US Sales Only), PC A12/MF A01.

From Workshop on high intensity accelerators and compressor rings; Karlsruhe, F.R. Germany (25 Jun 1981).

The German project for the construction of a Spallation Neutron Source with high proton beam power (5.5 MW) will have to cope with a number of radiation problems. The present report describes these problems and proposes solutions for keeping exposures for the staff and release of activity and radiation into the environment as low as reasonably achievable. It is shown that the strict requirements of the German radiation protection regulations can be met. The main problem will be the exposure of maintenance personnel to remanent gamma radiation, as is the case at existing proton accelerators. Closed ventilation and cooling systems will reduce the release of (mainly short-lived) activity to acceptable levels. Shielding requirements for different sections are discussed, and it is demonstrated by calculations and extrapolations from experiments that fence-post doses well below 150 mrem/y can be obtained at distances of the order of 100 metres from the principal source points. The radiation protection system proposed for the Spallation Neutron Source is discussed, in particular the needs for monitor systems and a central radiation protection data base and alarm system.

63397 (KFK—3228, pp 235-244) **Present status of the Rutherford and Appleton Laboratories H^- ion source.** Gear, P.E.; Sidlow, R. Nov 1981. NTIS (US Sales Only), PC A12/MF A01.

From Workshop on high intensity accelerators and compressor rings; Karlsruhe, F.R. Germany (25 Jun 1981).

A surface conversion ion source of the Penning type is being developed at the Rutherford and Appleton Laboratories for use with the pulsed spallation neutron source (SNS) currently under construction. The ion source is required to deliver 40 mA of H^- ions at a duty factor of 2.5% (50 Hz x 500 μsec). At the present time 30 mA of H^- ions have been extracted with the source operating at a duty factor of 2.1%.

63398 (KFK—3228, pp 245-250) **Control of γsub(tr) by sextupole magnets in IKOR.** Corsten, C.J.A. Nov 1981. NTIS (US Sales Only), PC A12/MF A01.

From Workshop on high intensity accelerators and compressor rings; Karlsruhe, F.R. Germany (25 Jun 1981).

As IKOR is proposed to operate very close to transition energy the variation of γsub(tr) with momentum is of interest. Analytical expressions which describe the dependence of γsub(tr) on the momentum are derived. The approximations made in this theory may not be used for IKOR. Sectupole strengths for the control of γsub(tr) are calculated analytically and are compared with numerical results obtained with the AGS program.

63399 (LA—9454-MS) **What is LAMPF II.** Thiessen, H.A. (Los Alamos National Lab., NM (USA)). Aug 1982. Contract W-7405-ENG-36. 15p. NTIS, PC A02/MF A01. Order Number DE82021254.

Portions of document are illegible.

The present conception of LAMPF II is a high-intensity 16-GeV synchrotron injected by the LAMPF 800-MeV H^- beam. The proton beam will be used to make secondary beams of neutrinos, muons, pions, kaons, antiprotons, and hyperons more intense than those of any existing or proposed accelerator. For example, by taking maximum advantage of a thick target, modern beam optics, and the LAMPF II proton beam, it will be possible to make a negative muon beam with nearly 100% duty factor and nearly 100 times the flux of the existing Stopped Muon Channel (SMC). Because the unique features of the proposed machine are most applicable to beams of the same momentum as LAMPF (that is, < 2 GeV/c), it may be possible to use most of the experimental areas and some of the auxiliary equipment, including spectrometers, with the new accelerator. The complete facility will provide improved technology for many areas of physics already available at LAMPF and will allow expansion of medium-energy physics to include kaons, antiprotons, and hyperons. When LAMPF II comes on line in 1990 LAMPF will have been operational for 18 years and a major upgrade such as this proposal will be reasonable and prudent.

63400 (LA-UR—82-2481) **Beryllium-beryllium oxide filter difference spectrometer.** Goldstone, J.A.; Eckert, J.; Taylor, A.D.; Wood, E.J. (Los Alamos National Lab., NM (USA)). Jun 1982. Contract W-7405-ENG-36. 18p. (CONF-8206118—2). NTIS, PC A02/MF A01. Order Number DE82021900.

From 6. annual international collaboration of advanced neutron sources meeting; Argonne, IL, USA (28 Jun 1982).

A successful experimental program has been initiated on the filter difference spectrometer. The instrument is most appropriate for energy transfers from about 50 to 600 MeV when moderate energy resolution is sufficient and a high count rate of importance. The difference technique is well enough understood so that peak positions, line widths and integrated intensities can be determined from fairly complex spectra. Several improvements to the instrument are in progress. An important change will be cooling of the sections which is expected to give approximately a factor of two increase in signal. The solid angle subtended by the detector banks will also be increased by a factor of 1.7 without significant degradation in resolution. With these improvements, much smaller samples can be examined in cases where material is unavailable in larger quantities, as well as samples with much small scattering cross sections. The major improvement will come when the proton storage ring becomes operational in 1985. A total increase of approximately 100 in neutrons detected will allow much more difficult experiments to be performed on this instrument with still a fast turnover rate.

63401 (IPNO—81-05, pp 279-288) **Charge transfer and ionization involving low-energy multiply charged ions.** Mueller, A. (Giessen Univ. (Germany, F.R.). Inst. fuer Kernphysik im Strahlenzentrum). [nd]. Dep. NTIS (US Sales Only).

From 2. workshop on EBIS and related topics; Saclay, France (12 May 1981).

Experiments involving multiply charged ions with KeV energies are reported. Cross section data are discussed for processes where the charge of the incident ion is changed by one or several units in an electron-capture or electron-impact-ionization collision.

4304 Storage Rings

63402 (DESY—81-088) **Quantitative prediction of bunch lengthening in high energy electron storage rings.** Weiland, T. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Dec 1981. 24p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82750623.

The longitudinal current dependent electromagnetic interaction between a bunch of charged particles and accelerator components can be described by a Green's Function in time domain or by an impedance in frequency domain. The aim of this paper is to describe a procedure which yields an approximate Green's Function for cylindrically symmetric objects. Once this Green's Function is quantitatively known the equation of motion for the particles can be solved easily by a turn-by-turn tracking code on a computer. Thus it is possible to predict the bunch length and width as a function of charge per bunch for future accelerators and storage rings based on pure geometrical data of the accelerator components. Results are presented for PETRA and LEP. A comparison between measurements at PETRA and computations shows an excellent agreement.

63403 (KFK—3228, pp 13-31) **Status of the Los Alamos proton storage ring.** Cooper, R.K.; Spalek, G. Nov 1981. NTIS (US Sales Only), PC A12/MF A01.

From Workshop on high intensity accelerators and compressor rings; Karlsruhe, F.R. Germany (25 Jun 1981).

The Proton Storage Ring for the Weapons Neutron Research Facility of the Los Alamos National Laboratory is reviewed as a construction project. The current status of construction and design is outlined.

63404 (KFK—3228, pp 57-61) **Injection system for the proton storage ring at LASL.** Hudgings, D.W.; Jason, A.J. Nov 1981. NTIS (US Sales Only), PC A12/MF A01.

From Workshop on high intensity accelerators and compressor rings; Karlsruhe, F.R. Germany (25 Jun 1981).

The Proton Storage Ring at LAMPF will accumulate a high current of 800-MeV protons by multiturn charge-changing injection. An 800-MeV neutral hydrogen atomic beam, formed by field ionization of H- ions in a 1.8 T transverse magnetic field, will be stripped to protons by a carbon foil. To minimize peak proton current on the foil, the beam orbit will be deformed so that the edge of the beam grazes the edge of the foil. As the beam diameter grows, the orbit perturbation is decreased, vanishing at the end of the accumulation cycle. The hardware requirements are simple. Single-turn orbit deformation magnets are pulsed to peak field and switched across power dissipation circuits that control the field decay rate. Stripping foil requirements and a method of calculating the desired orbit deformation are described.

63405 (KFK—3228, pp 229-234) **Self field effects on the beam in storage rings.** Mika, K.; Stanco, L.; Wuestefeld, G.; Vaccaro, V.G. Nov 1981. NTIS (US Sales Only), PC A12/MF A01.

From Workshop on high intensity accelerators and compressor rings; Karlsruhe, F.R. Germany (25 Jun 1981).

A high intensity beam (protons) moving in a storage ring creates sizable fields which act back on the particles. The influence of these self and mirror fields, excluding any additional RF fields, is taken into account to discuss the changing of a linear charge distribution. We describe the spatial deforming of the bunch in a first order approximation by a differential equation which is independent of any ring parameter. By a simple scaling law we can apply the solution to special ring dimensions. For a parabolic charge distribution we found an analytical solution for the time- and position-dependence of the charge density lambda(z,t) and of the particle momentum Δp/p (z,t).

63406 **Behaviour of single-ended vs. push-pull amplifiers for the accelerating systems of high-current beam storage rings.** Luccio, A.; Puglisi, M. (Brookhaven National Lab., Upton, NY (USA)). *Particle Accelerators;* **11**: No. 3, 153-160(May 1981).

Push-pull and single-ended amplifiers, both on common-anode configuration, are examined under very heavy beamloading conditions. The topological difference in behavior is demonstrated, and it is shown why a single-ended amplifier is to be preferred. Two technical examples are analyzed and discussed. Because of the inherent non-linearity of the problem, state-variable analysis is being used.

44 INSTRUMENTATION

4401 Radiation Instrumentation

REFER ALSO TO CITATION(S) 62794, 63400, 63491, 63507, 63509

63407 (ANU-P—813) **High resolution detection of heavy ions.** Leigh, J.R.; Ophel, T.R. (Australian National Univ., Canberra. Dept. of Nuclear Physics). Oct 1981. 9p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82701843.

Outstanding energy resolution (approx. 40 keV) has been achieved for low energy, heavy ions using a delay-line focal plane detector with a split-pole spectrometer.

63408 (ANU-P—814) **Two crystal compton polarimeter using standard Ge(Li) detectors.** Byrne, A.P.; Poletti, A.R. (Australian National Univ., Canberra. Dept. of Nuclear Physics). Aug 1981. 16p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82701844.

Two standard Ge(Li) detectors are used in a two crystal coaxial orientation for linear polarization measurements of 0.2-2 MeV gamma-rays. The sensitivity of the polarimeter is determined experimentally and with model calculations. The use of different geometries and kinematic gates is discussed and the usefulness of the polarimeter demonstrated with parity assignments to levels in ^{53}Cr.

63409 (CERN—82-01, pp 163-178) **Beam possibilities for the European Hybrid Spectrometer.** Coet, P.; Doble, N.; Reucroft, S. (European Organization for Nuclear Research, Geneva (Switzerland)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

The basic characteristics of the SPS H2 beam serving the European Hybrid Spectrometer (EHS) are presented, including brief descriptions of the target station capabilities, the various optical modes and instrumentation of the beam as well as the particle fluxes available, as measured in experiment NA20. Special facilities which have been introduced or are planned for EHS are: time-modulation, enriched (K^+), and tertiary (anti p, e) beams, including a proposed γ-tagging system. Finally some remarks on possible future developments (e.g. extracted anti p and neutral beams) are made with a view to widening the discussion.

63410 (CERN—82-01, pp 47-55) **HOBC, a heavy-liquid holographic bubble chamber: First results.** Herve, A.; Pothier, J.; Veillet, L.; Waurick, G. (European Organization for Nuclear Research, Geneva (Switzerland)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

HOBC, an acronym for Holographic Bubble Chamber, is a small (2 l) heavy-liquid rapid-cycling bubble chamber which has

been designed specifically for the use of in-line holography for the experiment NA25.

63411 (CERN—82-01, pp 56-61) **Holography in a freon bubble chamber. Preliminary results from the NA25 experiment at CERN.** Lecoq, P.; Olivier, P. (European Organization for Nuclear Research, Geneva (Switzerland)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

After some tests in a PS beam in the summer of 1981, the run took place in October 1981 in the H2 beam of the SPS. Although some problems of heat dissipation in freon limited the expansion rate of the bubble chamber, more than 11000 holograms were taken, showing 10 μm bubble tracks, with very good image quality and contrast. More than 100 tracks can be stored on a hologram without affecting the quality if all the bubbles are small. In addition, the analysis of the holograms does not look more complex than the exploitation of conventional high-resolution pictures.

63412 (CERN—82-01, pp 62-65) **Tests of scotchlite holography in the rapid-cycling bubble chamber.** Lecoq, P.; Olivier, P.; Wiatrowski, E. (European Organization for Nuclear Research, Geneva (Switzerland)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

Among several possibilities for a holographic set-up in the rapid-cycling bubble chamber (RCBC), the simplest one is probably to use RCBC as it is, with the Scotchlite as a reflector, and without modifying the optical ports. The aim of this report is to investigate the possibilities and the limitations of this approach.

63413 (CERN—82-01, pp 66-68) **Holographed charm candidates in experiment NA25.** Johansson, K.E. (European Organization for Nuclear Research, Geneva (Switzerland)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

We have observed two charm candidates in HOBC. It is demonstrated that small transverse decay lengths can be detected under realistic data-taking and scanning conditions using the holographic technique.

63414 (CERN—82-01, pp 69-74) **Rapid-cycling hydrogen bubble chamber HOLEBC.** Herve, A.; Leutz, H.; Passardi, G.; Seidl, W.; Tischhauser, J. (European Organization for Nuclear Research, Geneva (Switzerland)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

Since three years we have been designing, constructing, and operating hydrogen bubble chambers as vertex detectors for charm physics in hadron beams. The principal design considerations must take into account the formation of small bubbles of correspondingly high density along the tracks. This asks for expansion cycles which are close to the foam limit of hydrogen. To achieve this goal, we need a clean bubble chamber without any seals, which could favour parasitic boiling. To realize such a clean hydrogen chamber, we decided to construct its body entirely from plastic material. For photography this material must be transparent to visible light.

63415 (CERN—82-01, pp 75-86) **Holography with HOLEBC.** Sekulin, R.L. (Science Research Council, Chilton (UK). Rutherford and Appleton Labs.). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

The main aim of this report is to present and discuss the results obtained with holographic optics in HOLEBC in the recent test. Before this, however, a brief summary is given of the laboratory tests made in preparation for experimental runs. This review will serve partly to describe the optical configurations tried in the test, and partly to give some idea of the quality of hologram which it is hoped might ultimately be obtained.

63416 (CERN—82-01, pp 87-88) **HOLEBC with classical optics.** Bizzarri, R. (European Organization for Nuclear Research, Geneva (Switzerland)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

63417 (CERN—82-01, pp 92-100) **Future program of charm physics with the EHS applications of HOLEBC and the RCBC.** Fisher, C.M. (Science Research Council, Chilton (UK). Rutherford and Appleton Labs.). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

I answer the following questions in this talk: i) Since we have shown with NA16 that we can detect charmed particle decay vertices using the high resolution hydrogen chambers LEBC and now of course HOLEBC, why is it interesting to consider the RCBC. ii) If we are to consider RCBC for high resolution physics, what resolution do we need to achieve to be useful and what kind of experimental program can be foreseen.

63418 (CERN—82-01, pp 101-107) **High resolution with RCBC using classical optics.** Newport, R.W. (Science Research Council, Chilton (UK). Rutherford and Appleton Labs.). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

A brief assessment of the possibility of a classical optical system for RCBC to give a resolution of better than 50 microns is presented. Reference is made to the tests made in RCBC during August 1981 and to the system installed on the 40 inch SLAC chamber.

63419 (CERN—82-01, pp 108-109) **Classical high-resolution optics for the rapid-cycling bubble chamber. Practical aspects.** Benichou, J.L.; Dykes, M.; Guesewell, D.; Herve, A. (European Organization for Nuclear Research, Geneva (Switzerland)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

The RCBC, as a medium-size bubble chamber (visible volume 80 cm in diameter and 35 cm in depth), is equipped with three 'normal' cameras resolving 200 μm bubbles at 1:15 demagnification. It uses a Scotchlite background for bright field illumination, and photographs the bubble tracks through a 17 cm thick cold glass window and smaller double windows in the vacuum tank and-plate at almost 2 m distance from the track plane.

63420 (CERN—82-01, pp 110-111) **Holography in the CERN rapid-cycling bubble chamber. Practical aspects.** Guesewell, D. (European Organization for Nuclear Research, Geneva (Switzerland)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

Two schemes for holography in RCBC have been studied, one using the existing Scotchlite as a reflector and one using a spherical mirror on the RCBC piston. Whereas the first solution does not require any modification inside RCBC, can be easily combined with the normal cameras, and easily tested using any of the six warm windows, it will only offer a limited resolution, suffering from the imperfections of the Scotchlite as diffuser and from speckle.

63421 (CERN—82-01, pp 112-116) **Tests on a holographic method for the rapid cycling bubble chamber.** Miranda, E.E. (Science Research Council, Chilton (UK). Rutherford and Appleton Labs.). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hyorid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

This report describes a preliminary series of tests performed at RAL to investigate the possibility of using holography in RCBC. In these tests the geometry and dimensions of RCBC were reproduced as far as was practicable.

63422 (CERN—82-01, pp 117-122) **Choice of the recording arrangement for bubble chamber holography.** Royer, H. (Institut Franco-Allemand de Recherches de Saint-Louis, 68 (France)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

The main characteristics of the different recording arrangements are compared. The in-line system is the most simple and the cheapest but it does not suit to all types of chambers. The side-band systems yield different sorts of images and require different coherence, stability and energy conditions according to the type of illumination of the bubbles.

63423 (CERN—82-01, pp 123-132) **Problems on holographic imaging technique and adapt lasers for bubble chambers.** Bjelkhagen, H. (Kungliga Tekniska Hoegskolan, Stockholm (Sweden). Dept. of Production Engineering). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

Different types of holographic recording technique for bubble chambers are presented and compared. The influence of turbulence on resolution is discussed as well as the demand on laser equipment. Experiments on a test model of HOLEBC using a pulsed ruby laser are also presented.

63424 (CERN—82-01, pp 133-141) **Performance of the spectrometer for NA16.** Poppleton, A. (European Organization for Nuclear Research, Geneva (Switzerland)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

NA16 is an experiment at CERN which used a prototype version of the European Hybrid Spectrometer to reconstruct the decay products of short-lived charm particles produced and decaying in the small high resolution (approx. equal to 50μm) LExan Bubble Chamber (LEBC). An analysis of approximately 25% of the NA16 data led to results on charm properties presented at the Lisbon Conference on High Energy Physics.

63425 (CERN—82-01, pp 142-146) **Design performance of the NA26 spectrometer.** Zumerle, G. (European Organization for Nuclear Research, Geneva (Switzerland)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

In the following I describe the expected performance of the new detectors. Some preliminary experimental results from the October 1981 test run will also be reported.

63426 (CERN—82-01, pp 147-148) **Optical fiducial volume trigger system.** Pijlgroms, B. (European Organization for Nuclear Research, Geneva (Switzerland)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

63427 (CERN—82-01, pp 149-150) **Classical streamer chamber in the European Hybrid Spectrometer.** Johansson, K.E. (European Organization for Nuclear Research, Geneva (Switzerland)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

A streamer chamber situated inside the supraconducting spectrometer magnet complements very well a small high-resolution bubble chamber situated a bit further upstream. In the bubble chamber the very short-lived particles will be detected, and in the streamer chamber and the rest of the EHS spectrometer the momenta and identity of the majority of the produced particles will be determined.

63428 (CERN—82-01, pp 152-162) **Data rates and triggering.** Holmgren, S.O. (Stockholm Univ. (Sweden)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

Some numbers and thoughts concerning the event rates and triggering for charm experiments in EHS have been collected in this note.

63429 (CERN—82-01, pp 179-180) **Programme for high-resolution research with the European Hybrid Spectrometer in 1982-1983. A summary.** Montanet, L. (European Organization for Nuclear Research, Geneva (Switzerland)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

63430 (CERN—82-01, pp 181-185) **Scanning and measuring bubble chamber holograms.** Ciapetti, G. (Rome Univ. (Italy). Ist. di Fisica; Istituto Nazionale di Fisica Nucleare, Rome (Italy)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

I discuss some of the basic requirements and of the expected performances of an holographic scanning and measuring machine. I also assume that the main aim of the scanning will be the search for the decay of short living particles and that the measurements will be used to link the tracks observed in the bubble chamber with a downstream spectrometer.

63431 (CERN—82-01, pp 227-237) **Preliminary tests of holography in BEBC.** Pouyat, F. (European Organization for Nuclear Research, Geneva (Switzerland)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

A collaboration has been set-up between the Institut de Recherche in St. Louis (ISL), the Rutherford Appleton Laboratory (RAL), and the BEBC Group at CERN to study possibilities for application of holographic techniques in BEBC. Laboratory tests and a first trial in BEBC have shown that holograms can be recorded with a two-beam set-up adapted to the optics system of the chamber. The object beam passing through the fish-eye windows illuminates the chamber; after reflection from the Scotchlite panel at the bottom of BEBC it falls through a large-aperture lens onto the film plane. The reference beam is projected directly onto the holographic film plane without passing through the chamber liquid. First results are presented on the influence of the BEBC magnetic field, vibrations of the BEBC expansion system, and on the limitations on resolution to be expected. An outlook is given of future plans for trying to feed a test program on holography into the physics program of the chamber.

63432 (CERN—82-01, pp 238) **Status and plans of the Yale-FNAL High Resolution Streamer Chamber Collaboration.** Sandweiss, J. (Yale Univ., New Haven, CT (USA)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

63433 (CERN—82-01, pp 239-246) **Some results from a small high-pressure streamer chamber.** Eckart, V.; Wenig, S. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

In spite of the excellent results obtained for the accuracy and two-track resolution with emulsions and small bubble chambers, it is still interesting to use a streamer chamber (SC) for charm lifetime measurements because it is triggerable. A small SC with a track-sensitive volume of 50 mm diameter and 23 mm gap was constructed and operated between 5 and 20 atm pressure in the t_8 test beam at the CERN Proton Synchrotron (PS). Streamer densities of 43 to 67 streamers per centimetre were found. The track width, which is determined by the diffusion of the electrons, shrinks proportionally to $1/\sqrt{p}$ and reaches a mean displacement sigma of 70 μm in space at 20 atm. Under certain kinematic conditions this allows a measurement of the charmed particle lifetime as short as 10^{-13} s.

63434 (CERN—82-01, pp 89-90) **Dye laser light for high-resolution classical photography.** Geissler, K.K. (European Organization for Nuclear Research, Geneva (Switzerland)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

The test run with the bubble chamber HOLEBC in October 1981 offered the opportunity of checking the usefulness of despeckled dye laser light for illumination purposes in high-resolution classical dark field photography of small bubble chambers.

63435 (CERN—82-01, pp 186-199) **Hologram scanning and measuring device.** Lutz, J.R. (Strasbourg-1 Univ., 67 (France). Centre de Recherches Nucleaires). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

In the High Energy Physics area, the Charm hunting needs the use of Holography to perform recording of optical information with high resolution and large depth of field. The scanning and measuring of bubble chamber holograms reveal a bunch of problems, occured either by the holographic technique itself or by recorded event topology. The kink detection, the magnification, the optical and video improvements and the 'Z' motion will be checked. The final lay-out with the optical, video, and mechanical set-up will be described.

63436 (CERN—82-01, pp 200-208) **HOLMES project.** Drevermann, H.; Geissler, K.K. (European Organization for Nuclear Research, Geneva (Switzerland)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

HOLMES is a working prototype of a scanning and measuring machine for HOBC holograms. The machine is connected via CAMAC electronics, a MIK-11 microcomputer, and a serial link to a VAX computer. The scanning process is based on the use of TV displays.

63437 (CERN—82-01, pp 209-213) **Measuring device for holograms from large volume bubble chambers.** Cence, R.J.; Jones, M.D.; Parker, S.I.; Peterson, V.Z. (Hawaii Univ., Manoa (USA)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

Measuring full-size reconstructed holographic images of bubbles from a large bubble chamber presents problems of size, rapid location of the desired event, and precise measurement of a local region. We present a conceptual design of a practical system using computer-controlled mirrors to align the desired vertex region along the axis of motion of a vidicon whose field of view includes the local region. Precise measurements of short-decay paths are then made by fine adjustments of the vidicon position. This method requires normal stereo photography for scanning and preliminary reconstruction of the event.

63438 (CERN—82-01, pp 214-225) **Thermoplastic film camera for holographic recording.** Liegeois, C.; Meyrueis, P. (Strasbourg-1 Univ., 67 (France). Groupe de Recherche et d'Essais en Photonique Appliquee (GREPA)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

The design thermoplastic-film recording camera and its performance for holography of extended objects are reported. Special corona geometry and accurate control of development heat by constant current heating and high resolution measurement of the develop temperature make easy recording of reproducible, large aperture holograms possible. The experimental results give the transfer characteristics, the diffraction efficiency characteristics and the spatial frequency response.

63439 (CERN—82-01, pp 226) **Computer processing of holograms.** Meyrueis, P.; Liegeois, C. (Strasbourg-1 Univ., 67 (France)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

63440 **(DOE/RL/02225—T17-1) Measurement of delayed-neutron energy spectra. Progress report, February 1-August 1, 1970.** Woodruff, G.L. (Washington Univ., Seattle (USA). Dept. of Nuclear Engineering). Aug 1970. Contract AM06-76RL02225. 17p. (RLO—2225-T17-1). NTIS, PC A02/MF A01. Order Number DE82022530.

Portions of document are illegible.

This report discusses progress made on The Measurement of Delayed Neutron Energy Spectra, during the period from February 1, 1970-August 1, 1970. During this time progress was made in increasing the intensity of the neutron beam and in improving the shield used around the detectors to reduce room background. The target transfer system was completely redesigned in order to reduce the transit time from the irradiation position to the counting position and improve the cycle timing. New detectors were obtained which offer both greater sensitivity and improved resolution. Finally, the dual parameter system to provide gamma discrimination capability, thereby lowering the minimum neutron energy to a few kilovolts, is almost complete and should be operational before the end of August 1970.

63441 **(INT—154/I) Count rate effect in proportional counters. Part 4. The influence of the count rate and operating potential on the pulse rise time.** Bednarek, B. (Institute of Physics and Nuclear Techniques, Krakow (Poland)). 1980. 24p. (In Polish). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82701845.

The count rate effect on the pulse height and resolution observed in gas-proportional counters is - in a wide range of the count rate - the result of the rise-time variations of current pulses generated in the active volume of the counter. The paper presents a description of the probable physical processes governing the variations of the pulse rise-time which occur during the operation of the counter and are due to varying either the count rate or the applied voltage. On the basis of the pulse rise-time concept the differences in the count rate effect observed in various types of proportional counters are discussed.

63442 **(JINR-R—3-81-667) Fast ionization chamber for fission fragment detection with large amount of U-235.** Avdeev, S.P.; Bogdzel', A.A.; Dlougy, Z.; Duka-Zojomi, A.; Kliman, Ya.; Kuznetsov, V.D.; Presperin, V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics). 1981. 5p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702677.

The fast multilayer ionization fission chamber with a content of 10 g of ^{235}U and a total working area of 3630 cm^2 is described. It differs from the traditional one by the absence between aluminium foils - chamber electrodes - of distance rings from insulating material. Thus, a considerable decrease of the proper chamber capacity largely determining its fast response and decrease of the amount of absorbing and scattering material between its active volume and external detector could be attained. Besides there are not any pure aluminium foils in the chamber. All foils on both sides are covered by uranium oxide-monoxide layers which makes possible to reduce by half active length of the chamber and to make it more compact. The intrinsic capacity the chamber is 900 pF, its efficiencyhalf= reaches 70%, width of chamber pulse coincidence curve of the chamber as well as fast scintillation γ detector does not exceed 1.9 ns. The ideas assumed as a basis of the chamber design make possible to create an ionization chamber with a considerably greater amount of the fissing matter without noticeable decrease of registration efficiency.

63443 **(KFK—3238) Interactive general-purpose function minimization for the analysis of neutron scattering data.** Abel, W. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.)). Dec 1981. 34p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750511.

An on-line graphic display facility has been employed mainly for the peak analysis of time-of-flight spectra measured by inelastic scattering of thermal neutrons. But it is useful also for the analysis of spectra measured with triple axis spectrometers and of diffraction patterns. The spectral lines may be fitted by the following analytical shape functions: (i) a Gaussian, (ii) a Lorentzian, or (iii) a convolution of a Lorentzian with a Gaussian, plus a background continuum. Data reduction or correction may be invoked optionally. For more general applications in analysis of numerical data there is also the possibility to define the analytical shape functions by the user. Three different minimization methods are available which may be used alone or in combination. The parameters of the shape functions may be kept fixed or variable during the minimization steps. The width of variation may be restricted. Global correlation coefficients, parameter errors and the chi^2 are displayed to inform the user about the quality of the fit. A detailed description of the program operations is given. The programs are written in FORTRAN IV and use an IBM/2250-1 graphic display unit.

63444 **(LA—9351) Description of the FCUP code used to compute currents due to recoil protons from CH_2 foils.** Stelts, M.L.; Glasgow, D.W.; Wood, B.E.; Craft, A.D. (Los Alamos National Lab., NM (USA)). Jul 1982. Contract W-7405-ENG-36. 41p. NTIS, PC A03/MF A01. Order Number DE82021173.

Portions of document are illegible.

A computer code, FCUP, was developed at EG and G during the period from 1973 to the present to compute proton currents produced by a time- and energy-dependent neutron flux striking a CH_2 foil and knocking protons into a detector placed at an angle with respect to the target foil and the neutron beam. This report describes the methods of calculation used and the physical assumptions and limitations involved and suggests possibilities for improving the calculations.

63445 **(LA—9493-M) Neutron coincidence counter for MOX fuel pins in storage trays: users' manual.** Cowder, L.; Menlove, H. (Los Alamos National Lab., NM (USA)). Aug 1982. Contract W-7405-ENG-36. 18p. (ISPO—178). NTIS, PC A02/MF A01. Order Number DE82021261.

The neutron coincidence counter for measurement of mixed-oxide fuel pins in storage trays is described. The special detector head has been designed so that the detectors, high-voltage junction boxes, and electronics are interchangeable with those of the high-level neutron coincidence counter system. This manual describes the system components and the operation and maintenance of the counter. The counter was developed at Los Alamos National Laboratory for in-plant inspection applications by the International Atomic Energy Agency.

63446 **Particle detector using solid neon frozen from a neon-hydrogen mixture.** Cyko, W.; Howlett, L.; Mangene, C.; Miller, D.J. (Fermi National Accelerator Lab., Batavia, IL (USA)); Hanlon, J.; Rubin, H.A. (Illinois Inst. of Tech., Chicago (USA)); Napier, A. (Tufts Univ., Medford, MA (USA)). *Nuclear Instruments and Methods in Physics Research;* **196**: No. 2/3, 397-402(15 May 1982).

In developing an electromagnetic calorimeter to improve the analysis of neutrino events in large bubble chambers, the possibility of using a sandwich structure of lead and solid neon has been discussed. The tests reported here demonstrate that when neon-hydrogen mixtures, available in large quantities at CERN and Fermilab, are frozen in a small ionization counter the pulses produced by high energy muons are comparable to those seen previously with pure neon. It has also been demonstrated that contaminated and thus insensitive liquid argon yields clear particle pulses after it has been frozen solid.

63447 **Lead glass columns: A large shower detector at the SLAC Hybrid Facility.** Brau, J.E.; Butler, J.; Carroll, J.T.; Cautis, C.V.; Erickson, R.; Field, R.C.; Gearhart, R.; Moffeit, K.C.; Parker, D.B. (Stanford Linear Accelerator Center, CA (USA)); Bugg, W.M. (Tennessee Univ., Knoxville (USA)). *Nuclear Instruments and Methods in Physics Research;* **196**: No. 2/3, 403-413(15 May 1982).

A large lead glass shower detector containing 204 lead glass blocks and 250 finger hodoscope elements has been constructed and operated in a photoproduction experiment at the SLAC Hybrid Facility. An energy resolution of sigmasub(E)/E = (0.84 + 4.8/Esup(1/2))% has been achieved for electron energies between 4 and 16 GeV. Details of the apparatus, its stability monitoring system, and its use in triggering the bubble chamber are presented. The performance of the detector in electron identification and π^0 reconstruction is discussed.

63448 **Status and problems of semiconductor detectors.** Walton, J.T.; Goulding, F.S.; Haller, E.E.; Pehl, R.H. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). *Nuclear Instruments and Methods in Physics Research;* **196**: No. 1, 107-116(1 May 1982).

From INS international symposium on nuclear radiation detectors; Tokyo, Japan (23 - 26 Mar 1981).

A brief review is given of the types of silicon and germanium detectors used or presently being developed for nuclear experiments. Large-area silicon and germanium detector telescopes for use in long-range particle detection and indentification are emphasized. Large area position-sensitive detector are also described. Some results are presented regarding radiation damage and damage repair by annealing. Evidence is also presented for the importance of producting large area silicon crystals of adequate quality to reduce trapping problems to negligible proportions.

63449 **Neutron transmutation doped silicon detectors.** Kim, C. (Korea Univ., Tokyo (Japan). Dept. of Electronics Engineering); Kraner, H.W. (Brookhaven National Lab., Upton, NY (USA)); Itoh, D. (Komatsu Electronic Metals Co., Hiratsuka (Japan)); Husimi, K.; Ohkawa, S. (Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study); Shiraishi, F. (Rikkyo Univ., Yokosuka, Kanagawa (Japan). Inst. for Atomic Energy). *Nuclear Instruments and Methods in Physics Research;* **196**: No. 1, 143-148(1 May 1982).

From INS international symposium on nuclear radiation detectors; Tokyo, Japan (23 - 26 Mar 1981).

High resistivity n-type silicons has been produced from ultra-high purity p-type silicon by neutron transmutation doping. The material produced by this method has better dopant homogeneity and controllability than carefully produced floating zone crystals. The characteristics of a variation of detectors made from this material are equivalent to those of the conventional silicon detectors.

63450 Focal plane detector systems for the EPICS and HRS spectrometers at LAMPF. Morris, C.L. (Los Alamos National Lab., NM (USA)). *Nuclear Instruments and Methods in Physics Research;* **196**: No. 1, 263-269(1 May 1982).

From INS international symposium on nuclear radiation detectors; Tokyo, Japan (23 - 26 Mar 1981).

Delay-line readout drift chambers (DLRDC) have been developed as position-sensitive detectors for use in the focal planes of the EPICS and HRS spectrometers at LAMPF. These chambers provide an inexpensive alternative to individual wire readout chambers for applications which do not require the ability to resolve multiple track events. DLRDC have been built with active areas up to 60 x 60 cm^2. These chambers routinely provide position resolutions of 125 μm (fwhm), while operating at count rates up to 10^6 Hz. Details of chamber construction, operation, and performance in the spectrometer systems are presented.

63451 Axial field spectrometer at the CERN ISR. Gordon, H.; Hogue, R.; Killian, T.; Ludlam, T.; Winik, M.; Woody, C. (Brookhaven National Lab., Upton, NY (USA)); Burckhart, D.; Burkert, V.; Botner, O.; Cockerill, D. (European Organization for Nuclear Research, Geneva (Switzerland)). *Nuclear Instruments and Methods in Physics Research;* **196**: No. 1, 303-313(1 May 1982).

From INS international symposium on nuclear radiation detectors; Tokyo, Japan (23 - 26 Mar 1981).

The axial field spectrometer is being exploited in a wide-ranging programme to study pp and pp^- collisions which are characterized by a large transverse momentum. A specially shaped magnet together with an 'imaging' drift chamber is used for efficient detection and momentum analysis of high multiplicity events at interaction rates of up to 5 x 10^6s. Particle identification is accomplished over 1 sr; an uranium/scintillator hadron calorimeter will cover more than 8 sr in 1982 to provide an unbiased energy measurement.

63452 Monte Carlo simulation of an actual segmented calorimeter. A study of calorimeter performance at high energies. Gabriel, T.A.; Bishop, B.L. (Oak Ridge National Lab., TN (USA)); Goodman, M.S.; Sessoms, A.L. (Harvard Univ., Cambridge, MA (USA). High Energy Physics Lab.); Eisenstein, B. (Illinois Univ., Urbana (USA)); Kephart, R.D. (Fermi National Accelerator Lab., Batavia, IL (USA)); Wright, S.C. (Chicago Univ., IL (USA)). *Nuclear Instruments and Methods in Physics Research;* **195**: No. 3, 461-467(15 Apr 1982).

The program CALOR simulated the performance of a real segmented Fe-liquid argon calorimeter at energies ranging from 10 GeV to 250 GeV. The energy resolution, angular resolution and energy deposition of these Monte Carlo results are in accord with the experimental results available at 10-38 GeV. sigma(E)/E = (33.4/$\sqrt{E}$+5.07)% and sigmasub(THETA)(E) = 15.7+458/E mrad describe the resolutions.

63453 Use of multielement detector systems with synchrotron X-ray sources. Thompson, A.C. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). *Nuclear Instruments and Methods in Physics Research;* **195**: No. 1/2, 303-308(1 Apr 1982).

From 2. national conference on synchrotron radiation instrumentation; Ithaca, NY, USA (15 - 17 Jul 1981).

The extremely high intensity and pulsed structure of synchrotron radiation X-ray sources put very demanding requirements on associated X-ray detector. In current detector systems, trade-offs must be made between the efficiency, energy resolution, counting rate capability and the spatial resolution. Two detector systems are described which illustrate the optimization of these parameters for different applications of synchrotron radiation. One system is a segmented 16 channel multiwire proportional chamber which is used for fluorescent EXAFS measurements. The other is a 30 element Si(Li) linear detector array which is used for digital angiography experiments. The characteristics of these systems are discussed and recent results obtained with them are presented.

63454 Angular distribution parameters of argon, krypton and xenon for use in calibration of electron spectrometers. Holland, D.M.P. (Maryland Univ., College Park (USA). Inst. for Physical Science and Technology); Parr, A.C.; Ederer, D.L. (National Bureau of Standards, Washington, DC (USA)); Dehmer, J.L. (Argonne National Lab., IL (USA)); West, J.B. (Science Research Council, Daresbury (UK). Daresbury Lab.). *Nuclear Instruments and Methods in Physics Research;* **195**: No. 1/2, 331-337(1 Apr 1982).

From 2. national conference on synchrotron radiation instrumentation; Ithaca, NY, USA (15 - 17 Jul 1981).

Measurements are presented of the angular distribution parameter for the photoejected valence electrons of argon, krypton and xenon, from threshold to hν approx. equal to 25 eV. The experimental arrangement at the NBS (SURF II) storage ring is described and the method of data analysis discussed. The results are compared with other experimental data and theoretical predictions.

63455 Comparison of the NaI-CsI phoswich and a hyperpure germanium array for in vivo detection of the actinides. Berger, C.D.; Goans, R.E. (Oak Ridge National Lab., TN (USA)). *Health Physics;* **40**: No. 4, 535-542(Apr 1981).

An array of hyperpure germanium detectors has recently been employed at ORNL for the identification and quantification of internally deposited actinides. Its advantages over the phoswich detector - the current state-of-the-art for detection of the actinides - were found to be improved background reduction and superior energy resolution. The germanium system and the currently operating phoswich system are discussed and compared. The improvement in performance of the germanium system over the phoswich system (a factor of 2.5 for ^{239}Pu and 15.3 for ^{241}Am) appears to justify the financial investment, particularly when ^{241}Am is used as an indirect means of detection and measurement of ^{239}Pu.

63456 Low-level radionuclide measurement of extraterrestrial and environmental samples. Wogman, N.A. (PNL, Richland, WA 99352). *Transactions of the American Nuclear Society;* **39**: 66-67(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

4402 Radiation Effects On Instrument Components, Instruments, Or Electronic Systems

63457 (SAND—82-0780/C) Rapid annealing in advanced digital bipolar microcircuits. Wrobel, T.F.; Allen, D.J.; Evans, D.C. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 2p. (CONF-821112—2). NTIS, PC A02/MF A01. Order Number DE82020092.

From Government microcircuit applications conference; Orlando, FL, USA (2 Nov 1982).

This paper presents the results of an ongoing program designed to characterize the radiation response of integrated circuits produced with advanced processing techniques and to provide data suitable for circuit modeling in radiation environments. The paper is limited to short-term neutron responses of simple gate structures. Rapid annealing responses of Fairchild FAST and Texas Instruments ALS technologies were measured after neutron irradiation in a fast-burst reactor, and an analysis procedure for predicting these short-term responses was formulated.

4403 Miscellaneous Instruments

REFER ALSO TO CITATION(S) 63331, 63353, 63368, 63533, 63621

63458 (AREAEE—247) Temperature compensated log-ratio amplifiers for spectrophotometry. Hanna, N.N. (Atomic Energy Establishment, Inshas (Egypt). Engineering and Scientific Instrumentation Dept.). 1980. 15p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82905477.

Portions of document are illegible.

In spectrophotometry, a log-ratio amplifier is required to measure the absorbance of media. In this paper we show that the

inherent logarithmic properties of silicon junction devices can be used to provide the required signal. Readily available in monolithically matched pairs, log-ratio amplifiers are low in cost and can be easily compensated for temperature variation. Here we discuss their basic properties and the techniques for obtaining both thermal and dynamic stability. By proper choice of circuit configuration, the dynamic range can be extended without seriously affecting the overall accuracy. Log conformity to within 1% in 4 decades over the temperature range 20°C to 40°C can be achieved with commercially available silicon devices.

63459 (CERN—82-01, pp 26-34) **Dependence of transverse and longitudinal resolution on some parameters defining the set-up in holography.** Vanhomwegen, G. (Interuniversity Inst. for High Energies, Brussels (Belgium)). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

In this work a quantitative study has been made of the transverse resolution and of the longitudinal resolution as a function of these parameters. Special attention was paid to the dependence of the spatial resolutions on the distance parameter in the different set-ups.

63460 (CERN—82-01, pp 35-42) **Transparent media characterization using sub-pico second dye laser.** Lamy, F. (Strasbourg-1 Univ., 67 (France). Groupe de Recherche et d'Essais en Photonique Appliquee (GREPA)); Fontaine, J.J. (Strasbourg-1 Univ., 67 (France). Lab. de Spectroscopie et d'Optique du Corps Solide). 22 Mar 1982. Dep. NTIS (US Sales Only).

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

A new passively mode locked laser source developed at the Center for Laser Studies yielded pulses shorter than 0.14 ps, at a rate of 250 MHz or 0.3 ps pulses at a rate of 500 MHz. The laser and its modes of operation are described. With this source and a second order cross correlation technique similar to the autocorrelation used to determine the pulse duration, time domain reflectometry measurements can be made with a resolution of 40 μm. Three dimensional images can be made by time resolving the backscattered radiation of a beam scanned through a medium. The depth resolution of 0.1 μm can be carried over to the other two dimensions by computer reconstruction. The new technique should have important applications in medicine and biology. Because of the short duration of the laser pulses, high peak intensities can be used without damage to the tissues. Therefore, light measurements can be conducted through a larger depth than with continuous radiation.

63461 (FERMILAB/TM—1072) **Helium-to-neon modification for a DuPont 120SSA or 24-120 leak detector.** Juravic, F. (Fermi National Accelerator Lab., Batavia, IL (USA)). 26 Aug 1982. Contract AC02-76CH03000. 5p. NTIS, PC A02/MF A01. Order Number DE83000617.

When helium leak detecting is hindered by a system or atmosphere saturated with helium, leak checking can be continued by modifying the DuPont 120SSA/24-120 Mass Spectrometer Leak Detector to detect neon. Although DuPont markets a three gas leak detector (helium, neon and argon), the DuPont 120SSA/24-120 is convertible to neon by simply changing the magnet and retuning for neon peak. The sensitivity is 2×10^{-9} Atm/cc/sec/division neon. If an increase in sensitivity is desired, throttle diffusion pump with valve or install choke. Modification procedures and tuning procedures are described. (WHK)

63462 (NASA-CASE-GSC—12640-1) **Real-time 3d x-ray and gamma-ray viewer.** Yin, L.I. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). May 1981. 21p. NTIS, PC A02/MF A01.

A multi-pinhole aperture lead screen forms an equal plurality of invisible mini-images having dissimilar perspectives of an X-ray and gamma-ray emitting object onto a rare-earth phosphor layer which, in turn, provides visible light mini-images directly into a visible light image intensifier. A viewing screen having an equal plurality of dissimilar perspective apertures distributed across its face in a geometric pattern identical to the lead screen, provides a viewer with a real, pseudoscopic image of the object with full horizontal and vertical parallax.

63463 (RFP—3280) **Utilization of an automated multimeter calibration system by the Rocky Flats Standards Laboratory.** Wickoff, B.; Stant, R.S.; Brown, G.R. Jr. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). 10 Sep 1982. Contract AC04-76DP03533. 54p. NTIS, PC A04/MF A01. Order Number DE83000341.

Portions of document are illegible.

The Physical Metrology Laboratory (PML) of the Rocky Flats (RF) Standards Laboratory, like many other standards laboratories, was inundated during the past decade with the vast variety of new digital multimeters. These multimeters were produced by several companies, and required accurate calibrations and certification to support the requirements at the Rocky Flats Plant. The need to automate the calibration and certification process accurately was vividly indicated by a time study of performing the process manually, for both the digital and the analog multimeters, in the PML Reference Standards Laboratory. By using an automated calibration system, approximately 90% of these calibrations could be completed in the Physical Metrology Support Laboratories with a reduction of 50% or more in hours required for the calibrations. With these specific requirements and other specifications deemed necessary, the automated calibration systems for digital and analog multimeters were purchased. Two Fluke 5101B Calibrators with Fluke 5220A Transconductance Amplifiers and two printers were procured for use by the Physical Metrology Support Laboratories. There operation and performance are described.

63464 **Ultra-high vacuum double axis goniometer for use with an electron spectrometer.** Shleifer, M.; Williams, G.P. (Brookhaven National Lab., Upton, NY (USA). National Synchrotron Light Source). *Nuclear Instruments and Methods in Physics Research;* **195**: No. 1/2, 327-329(1 Apr 1982).

From 2. national conference on synchrotron radiation instrumentation; Ithaca, NY, USA (15 - 17 Jul 1981).

We describe a double axis goniometer designed for moving and indexing an electron spectrometer for angle resolved photoemission studies. A feature of the design is that the two rotations operate independently and either can be carried out with the analyzer at any position. The goniometer is designed to be installed in a 14", spool piece which makes it possible to add it to an existing 14" UHV system.

63465 **Electrical aerosol analyzer: an alternate method for use at high altitude or reduced pressure.** Yen, H.C.; Cheng, Y.S. (Lovelace Research Institute, Albuquerque, NM). *Atmospheric Environment;* **16**: No. 5, 1269-1270(1982). Contract AC04-76EV01013.

To use the Electrical Aerosol Analyzer (EAA) for determining submicron aerosol size distributions at reduced pressure, Yeh et al. (1981) developed a method by modifying the standard data reduction table. Based on the same assumptions i.e., the particle charging is independent of pressure when the charging parameter, Nt, is held constant, an alternative method was developed. A test indicated that these two methods are comparable and the agreement between the two is very good. The advantage of the present method is that all existing EAA data analysis packages or computer programs can be directly applied without any modificaton.

45 EXPLOSIONS AND EXPLOSIVES

4501 Chemical

REFER ALSO TO CITATION(S) 63324

63466 **(LA—9475-MS) Optical properties of explosive-driven shock waves in noble gases.** Jones, C.R.; Davis, W.C. (Los Alamos National Lab., NM (USA)). Sep 1982. Contract W-7405-ENG-36. 26p. NTIS, PC A03/MF A01. Order Number DE83000466.

Portions of document are illegible.

High explosives have been used to shock-heat rare gases to brightness temperatures up to 36,000 K. Temperatures were determined from radiometer signals at both 280 nm and 520 nm. Shock velocities up to 9 mm/μs were used in both planar and cylindrical geometries. Neon, argon, krypton, and xenon gases at atmospheric pressure were examined in planar shocks. Using argon, the effects of initial gas pressure and an admixed molecular species were observed. For a radial shock expansion in argon, brightness temperatures were measured over a range of shock velocities. Close agreement between brightness temperatures measured at both uv and visible wavelengths indicated that the shock fronts were radiating a blackbody spectrum. Time-resolved spectrograms of the emission also suggest that these sources are blackbody radiators. For a cylindrical shock expansion in argon, explosive energy was converted to optical energy with an efficiency of 4%.

63467 **(MHSMP—82-31) Thermal purification of TATB containing chloronitrobenzenes.** Locke, J.G.; Quinlin, W.T. (Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)). Sep 1982. Contract AC04-76DP00487. 6p. NTIS, PC A02/MF A01. Order Number DE82022475.

Three different processes for thermally removing chloronitrobenzene impurities from TATB were investigated. Each was found to reduce impurity concentrations to acceptable levels. Oven-drying is being used to recover ~ 21,000 kilograms of TATB.

63468 **(MHSMP—82-32) Effect of drying conditions on the moisture content of PBX 9502.** Copeland, R.J. (Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)). Sep 1982. Contract AC04-76DP00487. 7p. NTIS, PC A02/MF A01. Order Number DE82022476.

An investigation of the effects of drying on the moisture content of PBX 9502 powder and pressed pellets has been completed. The conditions studied were temperatures of 80, 100 and 120°C for times of 24, 48 and 72 hr. The optimum drying conditions (lowest moisture content) for the powder were determined to be 100°C for 24 hr. Pellets were pressed from PBX 9502 starting material and dried at these optimum conditions. A moisture content decrease from 0.132% to 0.113% was observed for the pellets using the Karl-Fischer technique. A much larger change (0.112% to 0%) was observed for the loose powder under the same drying conditions. This suggested that the conditions surrounding the pressing process was at least as important as the actual drying conditions for the powder before pressing.

63469 **(UCRL—87451-Rev.1) Detonation of porous, high HMX, nitroglycerine containing propellant by low level shock.** Green, L.G.; Chambers, E.S.; Lee, E.L.; Brown, B. (Lawrence Livermore National Lab., CA (USA); Hercules, Inc., Magna, UT (USA)). 1982. Contract W-7405-ENG-48. 9p. (CONF-821030—1-Rev.1). NTIS, PC A02/MF A01. Order Number DE82021928.

From 19. joint Army/Navy/NASA/Air Force combustion meeting; Greenbelt, MD, USA (4 Oct 1982).

Portions of document are illegible.

We have measured sympathetic detonation throw distances to impact damaged propellant. Reflected pressures at the threshold distances are about the same as pressures generated in piston compaction experiments on porous propellant at threshold piston velocities. Run distance to detonation experiments done on porous propellant using a steel impactor represent a final state from which run up to detonation occurs in both piston compaction experiments and in classical DDT experiments, which are seen as combustion driven mechanical compactions.

4502 Nuclear

REFER ALSO TO CITATION(S) 63470, 63851

4503 Explosion Detection

63470 **(UCID—19503) Analysis of an Eastern Kazakh explosion using regional Chinese seismograms: a pilot study.** Harris, D.B.; Taylor, S.R.; Patton, H.J. (Lawrence Livermore National Lab., CA (USA)). 19 Aug 1982. Contract W-7405-ENG-48. 48p. NTIS, PC A03/MF A01. Order Number DE82022514.

Portions of document are illegible.

A preliminary study of broadband regional seismic signals from an Eastern Kazakh explosion recorded at the Urumchi station in western China was made to evaluate data quality and to examine the feasibility of additional source and structural investigations. The data consist of broadband (flat to displacement between 0.08 and 10 Hz), photographic records from an SK Kirnos galvanometric system. The vertical-component seismogram appears similar to that expected for an eastern US path with the exception of the surface wave train which exhibits strong dispersion, especially for periods less than 7. Simultaneous inversion of Rayleigh wave phase and group velocities yield a crustal model dominated by the presence of very low velocities and a strong positive velocity gradient above 15 km depth. Velocities below 15 km depth are not significantly different from other continental structures underlain by Paleozoic or Precambrian basement. This model is consistent with geologic considerations indicating that most of the path is characterized by the presence of up to 10 km of sediments overlying a Paleozoic basement. The seismic moment of this event was measured using the Rayleigh-wave spectrum in the band 0.05 to 0.2 Hz. Assuming a spherically symmetric source and an amplitude decay rate similar to the eastern US, we obtain a moment of 2.5×10^{23} dyn-cm for an explosion with a modest overshoot (B=2) in hard rock and a moment of 1.0×10^{23} dyn-cm with a large overshoot (B=10). Using an estimate of the seismic moment and empirical relationships between moment and yield for NTS explosions, we can infer the yield. Uncertainties in the moment and in the moment-yield relationship give rise to an inferred yield ranging from 55 kt to 300 kt. Although this range is unacceptably large, substantial improvements can result with further constraints on the explosion source model and more work on the relationships between moment and yield.

63471 **(UCRL—53266) Analytic model for surface ground motion with spall induced by underground nuclear tests.** MacQueen, D.H. (Lawrence Livermore National Lab., CA (USA)). Apr 1982. Contract W-7405-ENG-48. 36p. NTIS, PC A03/MF A01. Order Number DE82016783.

Portions of document are illegible.

This report provides a detailed presentation and critique of a model used to characterize the surface ground motion following a contained, spalling underground nuclear explosion intended for calculation of the resulting atmospheric acoustic pulse. Some examples of its use are included. Some discussion of the general approach of ground motion model parameter extraction, not dependent on the specific model, is also presented.

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC

5001 Basic Studies

63472 **(DOE/RL/02225—2010) Study of atmospheric velocity and temperature spectra. Annual progress report.** Badgley, F.I. (Washington Univ., Seattle (USA). Dept. of Atmospheric Sciences). Apr 1969. Contract AM06-76RL02225. 9p. (RLO—2010-1). NTIS, PC A02/MF A01. Order Number DE82022539.

Portions of document are illegible.

Progress is reported in a study on the interaction of turbulence set up at a boundary layer with the mean flow to produce the

mean velocity distribution in the boundary layer. A low-speed wind tunnel was modified to study the flow of air from a smooth solid surface out over a water surface. Preliminary results are reported, although turbulence spectra have not yet been analyzed. (JGB)

5002 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 62589, 62631, 62632, 62807, 62857, 62859, 62860, 62861, 62862, 62996, 63299, 63465, 63498, 63499, 63500, 63501, 63502, 63514, 63528, 63560, 63561, 63562

63473 (BNL—31596) New instrumentation for airborne acid-rain research. Tanner, R.L.; Daum, P.H.; Kelly, T.J. (Brookhaven National Lab., Upton, NY (USA)). Apr 1982. Contract AC02-76CH00016. 21p. (CONF-820474—1). NTIS, PC A02/MF A01. Order Number DE82019543.

From 12. annual symposium on the analytical chemistry of pollutants; Amsterdam, Netherlands (14 Apr 1982).

Instrumental methods have been developed for continuously measuring sulfur dioxide, aerosol sulfur, nitrogen oxides, nitric acid, and ammonia from an aircraft sampling platform. Emphasis has been on modifications to reduce limits of detection to allow sampling at ambient concentrations in the vicinity of clouds. Characterizations based on ambient sampling data, in conjunction with data on cloud water composition and knowledge of the interphase behavior of nitrogen and sulfur oxides and oxyacids, will be used for quantitative evaluation of species contributions to the ionic content of precipitation. A flame photometric instrument with enhanced sensitivity for airborne measurements of both gaseous and aerosol sulfur compounds has been designed and constructed. Ambient airborne levels of less than one ppb may be detected using sensitivity enhancement, and effects of pressure changes on instrumental response have been eliminated. Sensitive, real-time measurements of NO/sub x/ and HNO_3 have been achieved by modified commercial ozone-chemiluminescence detectors. The detection limit for a dual channel instrument for aircraft use is < 0.2 ppb (5 second time constant). Nitric acid is determined continuously by difference using a nylon filter in one stream. An instrument has been constructed for airborne measurements of atmospheric ammonia based on a continuous, fluorescence derivatization technique. Ammonia is scrubbed into acqueous acid, derivatized and measured in a small filter fluorimeter (HPLC detector). Current detection limit is about 0.25 ppb NH_3 with response time of approx. 2.5 min. Data acquired from instrument test flights and preliminary characterization flights with this instrument package are discussed.

63474 (CONF-810687—Exec.Summ.) Report of US/USSR workshop on the climatic effects of increased atmospheric carbon dioxide. (US/USSR Agreement on Protection of the Environment. Working Group VIII). Jan 1982. 104p. NTIS, PC A06/MF A01. Order Number DE82904421.

From US/USSR workshop on carbon dioxide and climate; Leningrad, USSR (15 Jun 1981).

Working scientists representing a broad spectrum of disciplines from the United States and the Soviet Union met in a workshop to discuss details of past, present, and future changes of CO_2 in the atmosphere and the possible climatic consequences of those changes. It was concluded that the effects of authropogenic activities on the atmosphere are increasing; climate models indicate that the principal climatic consequences of the CO_2 increase may be an overall global warming of a few degrees C by the end of the 21st century; that the greatest warming is likely to occur in high latitudes; that such warming may have important consequences on the biosphere; and that it is necessary to pursue further coordinated research. (ACR)

63475 (DOE/EV/10406—1) Scavenging of aerosol by falling raindrops. Final report, July 1, 1980-June 30, 1982. Kerker, M. (Clarkson Coll. of Tech., Potsdam, NY (USA)). Sep 1982. Contract AC02-80EV10406. 13p. NTIS, PC A02/MF A01. Order Number DE83001140.

Work is reported on the redesign of a scavenging chamber in order to measure the collection efficiency of freely falling water drops for aerosol particles under conditions of controlled humidity. The humidity control has been installed and a new drop generator has been designed permitting formation of drops as small as 0.3 mm radius to fall through the apparatus. The generator for preparation of the AgCl aerosol particle has been rebuilt and particle size determination perfected. Problems remain in the analytical procedure for analysis of the uptake by the falling droplets of the AgCl and in humidity control in the chamber. Work along these lines is continuing as a separate project.

63476 (Juel—1742) Vertical profiles of trace gases at mid-latitudes. Volz, A.; Schmidt, U.; Rudolph, J.; Ehhalt, D.H.; Johnen, F.J.; Khedim, A. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Atmosphaerische Chemie). Oct 1981. 27p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750618.

This report compiles gas-chromatographic measurements of the vertical profiles of the trace gases H_2, CO, CO_2, N_2O, CF_2Cl_2, $CFCL_3$, CH_3Cl, CH_4, C_2H_6, C_3H_8, and C_2H_2 performed at the KFA-Juelich on samples collected in the stratosphere and troposphere at midlatitudes (43°N-51°N) during a joint project between the MPI fuer Aeronomie, the MPI fuer Chemie, Mainz, and the KFA-Juelich, as well as from a cooperation between, Boulder, Colorado, and the KFA-Juelich. These data have been discussed in various publications by various authors. However, the pictorial format in which the data are usually presented does not allow to extract the precise concentrations. For this purpose, our data are here compiled in form of tables. They give only the measurements performed at the KFA-Juelich, together with a discussion of the experimental techniques employed and their uncertainties.

63477 (LIS—17) Studies on dioxin emissions from municipal waste incinerators in Northrhine-Westphalia. Broeker, G.; Gliwa, H. (Landesanstalt fuer Immissionsschutz des Landes Nordrhein-Westfalen, Essen (Germany, F.R.)). 1982. 28p. (In German). Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe, Germany, F.R.

During the course of several days dust samples were taken in ten municipal incinerators in Northrhine-Westphalia. These dust samples have been prepared in the LIS prior to the PCDD analysis by combined gaschromatography and mass spectrametry performed by two Swiss institutes. In the dust deposited during the sampling time by the cyclone probe, TCDD could not be detected. The dust subsequently found in the quartz filter connected to the cyclone, proved to contain in one case, TCDD. Here the emission concentration of TCDD was found to be 14.3 ng TCDD/m³sub(n) in the stack gas. The single analysis of the different plants showed considerable different PCDD levels. Based on these results a first estimation of immission levels under consideration of realistic dispersion conditions was made. The maximal immission concentration of a 1 km^2 area, shows for TCDD I1 (mean value) and I2 (95% cumulative frequency) levels of I1 = 5.11×10^{-8} $\mu g/m^3$ and I2 = 4.77×10^{-7} $\mu g/m^3$. It is estimate that the part of the high toxical isomer 2, 3, 7, 8-TCDD is only 5% of the whole proved quantity of TCDD.

63478 (LMF—93) Release of formaldehyde from various consumer products. Final report. Pickrell, J.A.; Griffis, L.C.; Hobbs, C.H. (Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (USA). Inhalation Toxicology Research Inst.). Feb 1982. Contract AC04-76EV01013. 64p. NTIS, PC A04/MF A01. Order Number DE83000382.

The rates of formaldehyde release from consumer products containing formaldehyde were calculated by measuring the formaldehyde concentrations in water reservoirs placed in small static chambers with the products. Formaldehyde concentrations were analyzed using the pararosaniline or chromotropic acid procedures. The rates of formaldehyde release from selected consumer products (particle board, plywood) were measured at different temperatures and humidities in dynamic chambers. The formaldehyde release rate coefficients were compared between dynamic and static chambers. Rate of release of formaldehyde in dynamic chambers was similar to that measured in static chambers when adjusted for chamber loading. The degree of increase of release coefficients at lower loadings was similar in static and dynamic chambers. The loading effects observed in static chambers were adequately described by Fick's First Law of Diffusion. This diffusion was dependent on concentration, surface area and diffusion path length of the collecting reservoir. In static chambers, clothes, insulation products, paper

products, fabric and carpet had low release rates (≦ 10% of pressed wood products such as particle board, plywood and paneling). Most pressed wood products had much higher apparent release rates. Combined release coefficients from equal amounts of a high and a low release paneling were less than the average of the two separate dynamic rate coefficients, indicating the influence of surrounding materials on the measured release rate of formaldehyde. Similar results were noted for particle board and plywood in both the static and dynamic chambers. Changes induced in particle board formaldehyde rate coefficients by insulation or carpet were much less than those induced by plywood.

63479 **(PB—81-218117) Incentives for technological innovation in air pollution reduction: an ETIP policy research series. Volume 7: periodic review and technological escalation of performance standards: new source performance standards review process.** Foskett, W.H.; Olesen, T. (Performance Development Inst., Washington, DC (USA)). Dec 1980. 43p. NTIS, PC A03/MF A01.

The review was mandated in order to incorporate technological advances that have taken place since the standards' original formulation. It is shown that revisions are seldom made raising the question as to whether technological advances are overlooked or are non-existent.

63480 **(PB—81-218273) Incentives for technological innovation in air pollution reduction: an ETIP policy research series. Volume 8: controlled trading and site-specific SIP revisions: competing for attention in a crowded administrative route.** Evans, J. (Performance Development Inst., Washington, DC (USA)). Dec 1980. 108p. NTIS, PC A06/MF A01.

Factors regarding the impacts on innovation of regulatory incentives were studied. The report presents case studies and analysis showing how the success of these reforms is endangered by the slowness of the administrative route for approval in a state implementation plan (SIP).

63481 **(PB—81-226078) Calculations from compliance emissions of long and short term SO_2 concentrations in the southwest Pennsylvania air quality control region. Final report, 1979 - 1980.** (Cramer (H.E.) Co., Inc., Salt Lake City, UT (USA)). May 1981. 235p. NTIS, PC A11/MF A01.

The results of dispersion model calculations of maximum annual, 24 hour and 3 hour average ground level SO2 concentrations for selected areas in the region (AQOR) is described. The primary purpose of the model calculations was to assist EPA Region III and the Pennsylvania Department of Environmental Resources in determining the attainment or nonattainment of the National Ambient Air Quality Standards (NAAQS) for SO2 in the Beaver Valley and Monongahela Valley Air Basins exclusive of Allegheny County. All of the dispersion model calculations were made using the LONGZ and SHORTZ dispersion models with 1980 compliance emissions inventories containing 492 major SO2 sources located within the AQOR and in Ohio and West Virginia near the western border of the AQOR.

63482 **(PNL—4384-Exec.Summ.) Analysis of methods and models for assessing the direct and indirect economic impacts of CO_2-induced environmental changes in the agricultural sector of the US economy.** Callaway, J.M. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 28p. NTIS, PC A03/MF A01. Order Number DE83000070.

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Alternative methods for quantifying the economic impacts associated with future increases in the ambient concentration of CO_2 were examined. A literature search was undertaken, both to gain a better understanding of the ways in which CO_2 buildup could affect crop growth and to identify the different methods available for assessing the impacts of CO_2-induced environmental changes on crop yields. The second task involved identifying the scope of both the direct and indirect economic impacts that could occur as a result of CO_2-induced changes in crop yields. The third task then consisted of a comprehensive literature search to identify what types of economic models could be used effectively to assess the kinds of direct and indirect economic impacts that could conceivably occur as a result of CO_2 buildup. Specific attention was focused upon national and multi-regional agricultural sector models, multi-country agricultural trade models, and macroeconomic models of the US economy. The fourth and final task of this research involved synthesizing the information gathered in the previous tasks into a systematic framework for assessing the direct and indirect economic impacts of CO_2-induced environmental changes related to agricultural production.

63483 **(SR-APRG—12) Air pollution and related phenomena in South Africa.** (Council for Scientific and Industrial Research, Pretoria (South Africa)). Jun 1980. 63p. NTIS, PC A04/MF A01.

Progress in the monitoring of various pollutants, development of analytical methods for monitoring pollution effectively, and the study of the underlying physical and chemical processes governing the behavior of pollutants in the atmosphere is reported. Modeling of the wind field, momentum and energy transfer by eddy diffusion, and evaluation of diffusion models are among the topics addressed.

63484 **Nature of the data.** pp 8-94 of Ozone trend detectability. Hampton, VA; National Aeronautics and Space Administration (1981).

The locations of total ozone stations and of stratospheric ozone samplings were presented. The samplings are concentrated in three areas: Japan, Europe, and India. Approximately 75% of the total ozone measurements are made with Dobson instruments which offer the best international measurements. When well calibrated their accuracy is on the order of a few percent. It is found that although the total ozone percent is similar in both hemispheres, the northern hemisphere has 3 to 10% more ozone than the southern hemisphere. The close association between total ozone distribution and pressure distribution in the atmosphere is noted.

63485 **Measurements of surface layer turbulent ozone flux processes.** Droppo, J.G.; Doran, J.C. (Battelle Pacific Northwest Laboratories, Richland, Wash.). pp 507-509 of Symposium on Turbulence, Diffusion, and Air Pollution, 4th, Reno, Nev., January 15-18, 1979. Boston, MA; American Meteorological Society (1978).

From 4. symposium on turbulence, diffusion and air pollution; Reno, NV, USA (15 Jan 1979).

Dry removal processes of gaseous pollutants in the surface boundary layer have been investigated on the basis of data from ozone monitors at two sites in western and eastern Washington. Surface and atmospheric resistances have been examined using combined concentration profile and eddy flux data. The surface resistance value obtained for the semi-arid eastern Washington site (290 + or - 150 s/m) was in good agreement with results from measurements over a grassy field at the other site (270 + or - 160 s/m). Analysis of the ozone, temperature and velocity profiles indicates that the eddy diffusivity of ozone is more similar to the diffusivity for heat than to that for momentum.

5003 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 62790, 62791, 63304

63486 **(CNEN-RT/PROT—81-31) Applications of the atmospheric transport-diffusion models of the ARIES system.** Brofferio, C.; Cannizzaro, G.; Caracciolo, R.; Fiorenza, R.; Guidoni, A. (Comitato Nazionale per l'Energia Nucleare, Rome (Italy). Direzione Centrale della Sicurezza Nucleare e della Protezione Sanitaria). 1981. 76p. (In Italian). NTIS (US Sales Only), PC A05/MF A01. Order Number DE82905934.

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A detailed description is given of the atmospheric transport-diffusion models of the ARIES system, and applications to situations of simulated accidental release by the Caorso nuclear power plant are illustrated. The physical basis and main features of the models are discussed in some detail; the broader range of applicability to complex environmental situations compared with traditional

Gaussian models are shown. The appendix contains a detailed review of the meteorological and diffusivity input parameters. (JGB)

63487 **(EGG—1183-1771) Aerial radiological survey of the United States Department of Energy's Rocky Flats Plant, Golden, Colorado. Date of survey, August 1981.** (EG and G, Inc., Las Vegas, NV (USA). Energy Measurements Group). Sep 1982. Contract AC08-76NV01183. 27p. NTIS, PC A03/MF A01. Order Number DE83000931.

Portions of document are illegible.

An aerial radiological survey of the Rocky Flats Plant was conducted during August 1981. The survey consisted of an airborne measurement of both natural and man-made gamma radiation from the terrain surface in and around the Rocky Flats Plant. These measurements allowed an estimate of the distribution of isotope concentrations in the survey area. Results are reported as exposure rate, man-made, and ^{241}Am isopleths superimposed on photographs of the area. The survey covered a square area approximately 9.7 km on each side. Gamma ray energy spectra are also presented for the net man-made radionuclides.

63488 **Testing a mesoscale model with the Savannah River Plant krypton-85 air concentration data.** Praxler, R.R. (Air Resources Lab., Silver Spring, MD). *Atmospheric Environment;* **16**: No. 5, 1261-1264(1982).

A quantitative measure of the errors associated with calculated concentrations from a mesoscale trajectory-dispersion model are discussed in relation to averaging time and type of wind observations used for advection calculaions. Errors were determined by comparison of calculated air concentrations with measured values of Krypton-85 at 13 locations near Aiken, SC for 2 years of weekly and 4 months of twice-daily sampling. The error in calculated concentrations was found to decrease when tower wind data, in addition to the regular surface observations, were used in advection calculations.

63489 **Natural and technologically enhanced sources of radon.** Travis, C.C.; Watson, A.P.; McDowell-Boyer, L. M.; Cotter, S.J.; Randolph, M.L.; Fields, D.E. (ORNL, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **39**: 80-81(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63490 **Indoor radon sources, concentrations, and standards.** Nero, A.V. (LBL, Berkeley, CA 94720). *Transactions of the American Nuclear Society;* **39**: 83-84(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63491 **Development of a continuous monitoring system for measuring radon flux.** Ausmus, B.S.; Bradford, W.C.; Flint, R.D. (Bechtel, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **39**: 109-111(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63492 **Variations in radon working level with household conditions.** Siegel, J.M. (CRBRP, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **39**: 118-119(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63493 **WIND emergency response system.** Garrett, A.J.; Buckner, M.R.; Mueller, R.A. (SRL, Aiken, SC 29808). *Transactions of the American Nuclear Society;* **39**: 120-121(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63494 **Statistical evaluation of atmospheric dispersion models from krypton-85 data.** Weber, A.H.; Weber, J.H. (SRL, Aiken, SC 29808). *Transactions of the American Nuclear Society;* **39**: 124-125(1981).

63495 **Comparison of methods for predicting air concentrations near reactor complexes.** Miller, C.W. (ORNL, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **39**: 125-126(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

5006 Regulations

REFER ALSO TO CITATION(S) 63480

63496 **Is compliance with 40 CFR 192 reasonably achievable?.** Moment, M.H. (ANL, Argonne, IL 60439). *Transactions of the American Nuclear Society;* **39**: 86-87(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL

5101 Basic Studies

REFER ALSO TO CITATION(S) 62781

63497 **Biological monitoring - Part IIA - receiving system functional methods, relationships and indices.** Matthews, R.A.; Buikema, A.L. Jr., Cairns, J. Jr.; Rodgers, J.H. Jr. (Virginia Polytechnic Inst. and State Univ., Blacksburg). *Water Research;* **16**: No. 2, vp(1982).

In this review, a range of approaches to biomonitoring are discussed. The authors recommend a holistic approach contending that it will most accurately reflect the integrity of biological systems. Such holistic evaluations should incorporate three aspects. First, the approach should include the measurements of both biotic and abiotic structural and functional parameters. Second, testing strategies should include community and higher level biomonitoring tests. Finally, comparison studies between microcosms and field systems must be carried out. (JMT)

5102 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 63513, 63514, 63562

63498 **(EPRI-EA—2508) Response of agricultural soils to acid deposition.** Arthur, M.F.; Wagner, C.K. (Battelle Columbus Labs., OH (USA)). Jul 1982. 142p. (CONF-8105185—). NTIS, PC A07/MF A01. Order Number DE82906474.

From EPRI workshop on response of agricultural soils to acid depostition; Columbus, OH, USA (12 May 1981).

Proceedings of the workshop, Response of Agricultural Soils to Acid Deposition, which was held May 12-13 1981, in Columbus, Ohio, and which evaluated the potential beneficial and harmful impacts of atmospheric acid deposition on agricultural soils are presented. Those issues requiring further research are also identified. Five working papers and a literature review prepared by soils specialists are included as is a summary of conclusions reached by the participants. Each of the five working papers has been abstracted and indexed individually for ERA/EDB. (JGB)

63499 **(EPRI-EA—2508, pp 2.13-2.34) Impacts of acid deposition on N and S cycling.** Olson, R.A. Jul 1982. NTIS, PC A07/MF A01.

From EPRI workshop on response of agricultural soils to acid depostition; Columbus, OH, USA (12 May 1981).

Various aspects of the effects of increasing sulfur and nitrogen content of atmospheric pollution are considered. It is concluded that there is reasonable cause for doubt, however, that the elevated levels of acid deposition will have any serious damaging effects on agricultural soils and crops other than in close proximity to large coal-burning plants. Even with twice the current average N and S fallout onto soils of the country, the nutritional benefit received would outweigh the acidifying detriment on even inherently acid soils in the eastern half of the country. Recommendations are made for long-term coordinated research programs.

63500 (EPRI-EA—2508, pp 2.35-2.53) **Impacts of acid deposition on soil biota and C cycling.** Coleman, D.C. Jul 1982. NTIS, PC A07/MF A01.

From EPRI workshop on response of agricultural soils to acid depostition; Columbus, OH, USA (12 May 1981).

Several process-oriented aspects of soil biotic interactions and their effects on the soil C cycle are considered. Major emphasis is placed on results from experimental manipulations of acidity in grasslands and forests and on developing knowledge in zero-till versus conventional tillage agriculture. In terms of both C and energy flow, a major portion of the action follows the primary production detritus/decomposer pathway. Certain litter-dwelling organisms and attendant processes, such as litter decomposition, are seriously impacted by decreasing pH. Examples from forest and grassland studies are cited. Minimum tillage studies are examined, in terms of effects of placement of residues on both biotic and abiotic responses in agricultural systems. Some little-studied (as yet) groups, such as protozoa, are noted as probably important target organisms in localized pH changes at or near the soil surface. General aspects of energy and nutrient flows in ecosystems are then considered. Further studies in both theoretical and applied ecology are required to answer important questions of stress or effects, such as acid deposition in agro-ecosystems.

63501 (EPRI-EA—2508, pp 2.54-2.63) **Impact of acid deposition on P cycling.** Cole, C.V.; Stewart, J.W.B. Jul 1982. NTIS, PC A07/MF A01.

From EPRI workshop on response of agricultural soils to acid depostition; Columbus, OH, USA (12 May 1981).

Phosphorus cycling is examined over a range of ecosystems found in the United States. The productivity of agricultural soils requires an active cycling of soil P pools through plants and microbial populations. P cycling rates are thus closely linked to transformations of C, N, S, and other mineral nutrients. A systems approach to an understanding of factors controlling chemical and biological processes in ecosystems is necessary for an evaluation of the impacts of acid deposition on agricultural soils. Acid deposition effects on P cycling will be most pronounced on soils subject to intense weathering and erosional processes. Management practices developed to relieve these stresses will be most useful in mitigating impacts of acid deposition.

63502 (EPRI-EA—2508, pp 2.64-2.75) **Impacts of acid deposition on micronutrient cycling in agro-ecosystems.** Mortvedt, J.J. Jul 1982. NTIS, PC A07/MF A01.

From EPRI workshop on response of agricultural soils to acid depostition; Columbus, OH, USA (12 May 1981).

The amounts of micronutrients in soils, sources of their additions and losses, and general effects of soil pH on micronutrient chemistry and plant uptake are discussed. Probable effects of acid deposition on soil pH and micronutrient cycling in agro-ecosystems are outlined. Micronutrients considered are B, Cu, Fe, Mn, Mo, and Zn.

63503 **(NP—2906144) Investigations on the mercury concentration in lung tissue and blood of dead persons in different living spaces of the Federal Republic of Germany.** Link, G. (Erlangen-Nuernberg Univ., Erlangen (Germany, F.R.). Fachbereich Medizin). 2 Jul 1979. 47p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82906144.

Thesis.

Venous blood and lung tissue from the apical segment of the left upper lung lobe and of the pericardial region of the lingula, taken from 153 dead persons, were investigated on their mercury concentration. The Hg concentrations found in the blood were - as it had been expected - the highest in group II (Dortmund) (mean value 1.2 μg/100 ml) and the lowest concentrations appeared in group III (Bavarian Forest/Upper Palatinate) (mean value 0.9 μg/100 ml), group I (Erlangen-Nuremberg) with its mean value of 1.0 μg/100 ml was between the two other groups. For both pulmonary regions with reference to the weight in wet and dry condition, for group III (Bavarian Forest/Upper Palatinate) the highest and for group I (Erlangen-Nuremberg) the lowest values were found in the median. Generally seen the existing differences are only slight, since the results cover a very large range. The mean Hg concentration referred to the weight in wet condition was about 25 μg/kg, the mean Hg concentration referred to the dry weight was about 130 μg/kg. There were no significant differences between the apical and basal pulmonary parts to be found. Statistically there could no correlation between Hg concentration and pulmonary tissue be determined. It was also not possible to make sure any sex and age dependences of the Hg concentrations in the blood and in the pulmonary tissues.

63504 **(NP—2906145) Lead content of blood and lungs in dead persons from different living spaces of the Federal Republic of Germany.** Treuner, I. (Erlangen-Nuernberg Univ., Erlangen (Germany, F.R.). Fachbereich Medizin). 5 Jul 1979. 36p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82906145.

Thesis.

In three patient groups of dead persons, who had been living in areas with different degrees of industrialisation in the Federal Republic of Germany, the content of lead in blood and lungs was measured in order to find out whether the lungs act as a depot for lead taken up through the lungs; whether regional, age- and/or sex-specific differences in the lead content of the pulmonary tissue are existent; and whether in the individual parts of the lungs different lead concentrations are to be found. The lead level of the venous blood and of the pulmonary tissue was determined. As reference value also the iron content was measured. An age or sex dependence of the blood and pulmonary lead concentration could not be detected. Neither a significant connection between the lead values found for the blood and those for the lungs could be recognized. With reference to the results obtained by these investigations the conclusion seems to be justified that differences of the ecological lead load represent themselves better in the blood lead level than in the lead concentrations of the pulmonary tissue. Since the lead concentrations in pulmonary tissue - referred to the weight in wet condition - are within the range of the blood lead level, it appears probable that the lungs do not have a significant function as lead depot.

63505 **(PB—81-221863) Liners of natural porous materials to minimize pollutant migration. Final report, Oct. 1975 - Sep. 1977.** Fuller, W.H. (Arizona Univ., Tucson (USA)). Jul 1981. 86p. NTIS, PC A05/MF A01.

The use of natural low-cost materials as barriers for minimizing pollution migration out of landfills by retaining contaminants from liquids was investigated. The relative effectiveness of natural low-cost liners of crushed limestone, clayey soil, hydrous oxides of iron, and crushed pecan hulls for minimizing the migration of Be, Cd, Cr, Fe, Ni, Zn, and total organic carbon constituents of municipal solid waste landfill leachates was evaluated. Several leachate variables such as aqueous dilution, aeration, pH, and flux were also studied for their effect on movement of metals through 11 representative U.S. soils. Laboratory investigations using soil columns as a first step in screening for potential liners and manipulation practices are described. Limestone and hydrous iron oxide were found to be potentially useful as porous liners for retention of metallic leachate constituents. The amounts of these materials in natural soil were also found to be useful predictors of contaminant removal.

5103 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 62771, 62790, 62791, 63303, 63456

63506 **(ORNL-tr—4859) Measurements of deposition and biological half-life of iodine on vegetation.** Heinemann, K.; Vogt, K.J. (Oak Ridge National Lab., TN (USA)). [nd]. Contract W-7405-ENG-26. Translation source information not available . (CONF-7810133—7-Trans.). 21p. NTIS, PC A02/MF A01. Order Number DE83000759.

From 12. annual symposium of the German Health Physics Society--radioactivity and the environment; Norderney, F.R. Germany (2 Oct 1978).

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Tests were conducted to determine the environmental exposure pattern for radioactive iodine released to the ecosystem. (PSB)

63507 **(LA—9363-LLWM) Evaluation of an automated assay system to measure soil radionuclides by L x-ray and gamma-ray spectrometry.** Nyhan, J.W.; Drennon, B.J.; Crowell, J.M. (Los Alamos National Lab., NM (USA)). Aug 1982. Contract W-7405-ENG-36. 11p. NTIS, PC A02/MF A01. Order Number DE82021172.

An automated radionuclide assay system for conducting soil radioassays using L x-ray and gamma-ray spectrometry was evaluated. Wet chemistry assay procedures were shown to be considerably more time consuming than similar analyses of soil on this radionuclide assay system. The detection limits of ^{241}Am and plutonium were determined, as well as the reproducibility of radionuclide assay results. The L x-ray spectrometric measurements were compared with radiochemical analyses on several tuff samples. The assay system's intrinsic germanium detector was found to respond linearly to varying low concentrations of ^{241}Am and plutonium, both of which were easily detected in the presence of elevated concentrations of ^{137}Cs.

63508 **Contaminant migration into drainageways from stored pitchblende residues.** Anderson, T.L.; Ausmus, B.S. (BCL, Columbus, OH 43201). *Transactions of the American Nuclear Society;* **39**: 97-99(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63509 **Alpha-beta-gamma spectrometer as an aid in directing decontamination of soils.** Berger, C.D. (ORNL, Oak Ridge, TN 378303). *Transactions of the American Nuclear Society;* **39**: 102-103(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63510 **(ORNL-tr—4892) Content of microelements and the natural radioactivity of the food products from several regions in the Kiev Oblast.** Barannik, P.I.; Mikhalyuk, I.A.; Motuzkov, I.N.; Yatsula, G.S. Translated from *Voprosy Pitaniya ;* **29**: No. 1, 79-81(Jan 1970). Contract W-7405-ENG-26. 5p. NTIS, PC A02/MF A01. Order Number DE83000247.

The present report presents data on a study of the contents of nickel, vanadium, barium, lead, chromium and manganese, as well as the level of natural radioactivity of vegetable products from four regions in the Kiev Oblast which have endemic and non-endemic goiter.

63511 **(ORNL-tr—4897) Radioactivity of vegetable crops.** Muminov, M.M.; Maksudov, U. Translated from *Doklady Akademii Nauk Uzbekskoi SSR ;* No. 11, 24-25(1967). Contract W-7405-ENG-26. 4p. NTIS, PC A02/MF A01. Order Number DE83000024.

Potatoes, carrots, onions, turnips, and radishes grown in several areas of the Samarkand Oblast were studied to ascertain their natural radioactivity. Results of beta and gamma measurements are presented. (ACR)

63512 **(ORNL-tr—4905) Uranium content in the external environment and human excreta.** Berdnikova, A.V. Translated from *Voprosy Pitaniya ;* **23**: No. 4, vp(1964). Contract W-7405-ENG-26. 8p. NTIS, PC A02/MF A01. Order Number DE82022173.

Uranium migration from soil and water into animal and vegetable products was studied. A direct correlation between the amount of uranium in soil, water, and foodstuffs was found. Uranium accumulates in different proportions on the surface and inside vegetables. There was no differences in uranium concentration between roots and tops. Data on water, soil, and foodstuffs in different years and seasons indicate the relatively constant concentration of uranium in investigative objects. No selectively accumulating uranium was observed among the foodstuffs investigated. The primary source of uranium for man is water, 1.5% of the daily amount of uranium enters with foodstuffs.

5105 Site Resource And Use Studies

63513 **(BNL—51405) Environmental aspects of energy related solid waste.** Crowther, M.A.; Morris, S.C. (Brookhaven National Lab., Upton, NY (USA)). Apr 1981. Contract AC02-76CH00016. 130p. NTIS, PC A07/MF A01. Order Number DE83000769.

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The problem of disposal of solid waste from energy industries is considered. Information on the composition of solid waste from energy industries, options for its disposal, and possible environmental impacts is presented. Coal combustion, gasification, liquefaction, and oil shale are considered. Particular emphasis is given to the problem of increasing energy solid wastes in urban areas. Substantive problems include: water pollution potential of soluble inorganic and organic materials; land degradation at waste disposal sites; fugitive emissions including dusts, reentrained fly ash, and volatilized releases from sludge ponds; and potential mutagenicity in fly ash. Areas where data are insufficient for full examination and analysis are also considered.

63514 (EPRI-EA—2508, pp 2.1-2.12) **Sensitivity ratings of soils to acid deposition: a review.** McFee, W.W. Jul 1982. NTIS, PC A07/MF A01.

From EPRI workshop on response of agricultural soils to acid depostition; Columbus, OH, USA (12 May 1981).

Known and expected effects of acid precipitation on soils are summarized. Soil chemistry and acidification processes are discussed, and methods for rating the sensitivity of soils are described. (JGB)

63515 **(ORNL/TM—8359) Growth, nutrient absorption, and moisture status of selected woody species in coal-mine spoil in response to an induced infection by the ectomycorrhizal fungus Pisolithus tinctorius.** Walker, R.F.; West, D.C.; McLaughlin, S.B. (Oak Ridge National Lab., TN (USA)). Sep 1982. Contract W-7405-ENG-26. 106p. NTIS, PC A06/MF A01. Order Number DE83000377.

Thesis. Submitted to University of Tennessee, Knoxville.

In this study, nursery grown loblolly and Virginia pine seedlings infected with Pisolithus and control seedlings were outplanted on a coal mine spoil in Tennessee which had been previously hydroseeded. Granular fertilizer was applied by broadcasting to one-half of the seedlings of each ectomycorrhizal treatment at the rate of 112 kg/ha NPK. After 3 years, the survival and growth of loblolly pine infected with Pisolithus were superior to that of the control seedlings, and chemical analyses of foliar samples revealed that the seedlings with Pisolithus ectomycorrhizae had a higher foliar concentration of NO_3 and a lower concentration of Zn than the control seedlings. The survival, growth, and nutrient absorption of Virginia pine were not significantly affected by the infection with Pisolithus after 2 years, but both loblolly and Virginia pine seedlings with Pisolithus ectomycorrhizae exhibited an enhanced ability to absorb water during periods of high moisture stress, as determined by the pressure chamber technique. Fertilization substantially reduced the survival of the seedlings of both species. Sweet birch and European alder were grown under high, intermediate, and low fertility regimes in sand culture containing a mycelial inoculum of Pisolithus tinctorius for 5 months and then transplanted to coal mine spoil containing an identical Pisolithus inoculum. Control seedlings of each species were similarly grown except that no inoculum was incorporated into the potting media. The nutrient treatments initiated in the sand culture were continued throughout the study. Examinations of the roots of the sweet birch seedlings revealed that high fertility significantly reduced the development of

Pisolithus ectomycorrhizae, but Pisolithus formed abundant ectomycorrhizae on the roots of sweet birch grown under the intermediate and low fertility regimes and these seedlings were significantly larger than comparable control seedlings.

63516 **Food habits of bobcats in eastern Tennessee.** Story, J.D.; Galbraith, W.J.; Kitchings, J.T. (Oak Ridge National Lab., TN). *Journal of the Tennessee Academy of Science;* **57**: No. 1, 29-32(Jan 1982). Contract W-7405-ENG-26.

Food habits of bobcats (Lynx rufus) in eastern Tennessee were determined from analyzing 176 cat samples collected on the Oak Ridge National Environmental Research Park. Remains of cottontail rabbits (Sylvilagus floridanus) were the most frequently occurring food item. White-tail deer (Odocoileus virginianus) and pine vole (Microtus pinetorum) remains also were found frequently in samples. Data obtained from this study indicated that food preferences for bobcats in eastern Tennessee are similar to those in other southeastern states where the habitat is similar to the Oak Ridge area and somewhat different from those with significantly different habitat.

52 ENVIRONMENTAL SCIENCES, AQUATIC

5201 Basic Studies

REFER ALSO TO CITATION(S) 62895, 63537

63517 **Habitat patterns in a small mammal community.** Kitchings, J.T.; Levy, D.J. (Oak Ridge National Lab., TN). *Journal of Mammalogy;* **62**: No. 4, 814-820(Nov 1981). Contract W-7405-ENG-26.

Microhabitat relationships between four sympatric small mammal species (Peromyscus leucopus, Ochrotomys nuttalli, Blarina brevicauda, and Tamias striatus) were examined to determine if their discriminant analysis of small mammal habitat represented a unique habitat utilization pattern for a specific small mammal community. The authors concluded that habitat is only one of many dimensions to be considered when studying the interactions of sympatric species. Reproductive strategy, activity patterns, and other factors make up the n-dimensional hyperspace of an animal's niche. Thus differences in habitat usage alone cannot be used to determine niche overlap and competition between species. (JMT)

5202 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 62663, 63475, 63498, 63499, 63500, 63501, 63502, 63513, 63565

63518 **(DOE/EV/10253—3) Multi-solute subsurface-transport modeling for energy solid wastes. Technical progress report, September 1, 1981-August 31, 1982.** Theis, T.L.; Kirkner, D.J.; Jennings, A.A. (Notre Dame Univ., IN (USA). Dept. of Civil Engineering). Aug 1982. Contract AC02-79EV10253. 143p. NTIS, PC A07/MF A01. Order Number DE82021540.

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Progress on the development and application of advanced subsurface solute transport models is reported. The goal is to develop models which are capable of describing both the physical and chemical factors which affect the transport of solutes through a porous media. Of special concern is the inclusion of complex solution and soil chemical interactions which are known to be of importance in the leachates and soils associated with wastes produced from energy processes. At the present time a one-dimensional multi-solute finite element model (termed FIESTA) for flow in a homogeneous medium has been developed. It includes the effects of dispersive and convective mass transport and the chemical factors of nonlinear ion exchange and adsorption, and solution phase complex formation. Up to six chemical components (each of which includes all solution and sorbed phase complexes) plus the soil surface can presently be accomodated. A User's Guide for the Fiesta program is included in this report. The derivation of the governing equations is summarized and the numerical techniques and algorithms used to achieve a solution are described. Laboratory methods for determining equilibrium sorption constants are presented, discussed, and applied to solute transport in dynamic column studies. In comparing model simulations to experimental data, two factors appear to be important: competitive effects among solutes for surface sites, leading to the possibility of chromatographic effects; and the potential role of surface kinetics, particularly for desorption reactions. Application of the model to a field site reveals that competitive effects are important under realistic conditions of flow velocity, solute concentrations, etc. The status of an ongoing search for field data bases of suitable quality for application of the model is summarized.

63519 **(NUREG/CR—2823) Review of the impact of copper released into marine and estuarine environments.** Harrison, F.L. (Lawrence Livermore National Lab., CA (USA)). Sep 1982. Contract W-7405-ENG-48. 124p. (UCRL—53042). NTIS, PC A06/MF A01.

Information on the concentrations of copper in abiotic and biotic compartments of marine and estuarine ecosystems and the effects on biota of increased amounts of copper in the water and sediments were reviewed. Data compiled and discussed include the quantities and physicochemical forms of copper in the water column, the concentrations of copper in the bedload sediments and interstitial waters, and the concentrations of copper in primary producers, annelid worms, molluscs, crustacea, minor invertebrates, and fishes. In addition, the acute and sublethal effects of copper on the same groups of biota were presented as well as data on copper concentration factors. This information can be used to evaluate for different types of ecosystems the ranges of concentrations that occur in nature, to identify ecosystems that are or may be impacted by copper released from industrial and urban sources, and to assess the effects on biota of the use of copper alloys in nuclear power station cooling systems.

63520 **(PB—81-212037) Industrial process fugitive emissions inventory for the Region V Great Lakes Shoreline. Final report.** Mackus, C.; Lin, E. (Pacific Environmental Services, Inc., Elmhurst, IL (USA)). 1980. 261p. NTIS, PC A12/MF A01.

The study revealed that approximately 229,000 to 531,000 tons of fugitive particulates were deposited into the Great Lakes during 1978. Large industrial cities such as Chicago, Gary, Cleveland, Toledo, Detroit, and Milwaukee were found to have the largest concentration of major fugitive emission sources. Iron and steel industries were found to be the largest fugitive emission sources bordering the lakes.

63521 **Biological monitoring - Part III - receiving system methodology based on community structure.** Herricks, E.E. (Univ. of Illinois, Urbana); Cairns, J. Jr. *Water Research;* **16**: No. 2, 141-153(1982).

Applications of community structural analysis in biomonitoring programs must be practical but also have a base in fundamental ecological principles. Descriptive approaches are essential in biomonitoring programs because only through careful description can one characterize the aquatic community. Analytical approaches are also necessary if one wishes to quantify cause-effect relationships. The goal of the biomonitoring efforts should be the development of information resources that will also decision-making based on certainty of cause-effect relationships. This can be achieved through a conjunction of descriptive and analytical approaches to community structure biomonitoring. (JMT)

63522 **Continuous monitoring, automated analysis, and sampling procedures.** Pitt, W.W. Jr.; Denton, M.S. (Oak Ridge National Lab., TN). *Journal - Water Pollution Control Federation;* **54**: No. 6, 576-583(1982).

A strong emphasis on effluent monitoring continues both in the United States and abroad, as evidenced by numerous studies cited in this literature review. Some of the most significant developments in monitoring of pollution from industrial, municipal, and agricultural contaminants as well as state-of-the-art descriptions of monitoring methods are included. Costs of analyzing toxic pollut-

ants are reported to range from $10/sample to $200 for a complete analysis of 127 priority pollutants. Included are 107 references. (JMT)

63523 **Floating asphalt blocks of the Dead Sea.** Nissenbaum, A. (Weizmann Inst. of Science, Rehovot, Israel); Aizenshtat, Z.; Goldberg, M. *Physics and Chemistry of the Earth;* **12**: 157-161(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

Large blocks of mineral matter free (less than 0.1%) asphalt are occasionally found floating on the surface of the Dead Sea. Chemical, spectroscopic and isotopic data are given for the asphalt. The source of the asphalt is not accurately known, but presumably it represents mobilization of heavy viscous asphaltic masses at depth below the lake bottom into the floor of the lake. It may be released to the surface by earth tremors.

5203 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 62790, 62791

63524 (Juel-Conf—40, pp 50-72) **Oceanic dispersion processes.** Kautsky, H. Nov 1980. (In German). NTIS (US Sales Only), PC A08/MF A01.

From Meeting on deep-sea burial of radioactive wastes; Juelich, F.R. Germany (29 Jan 1980).

This report briefly describes the present state of knowledge of the radionuclide migration in sea water as well as the hydrographic and radiological examinations carried out in the Iberian sea bed, which is the place for radioactive waste disposal packed in containers chosen on international basis by the Nuclear Energy Agency and used since 1967. The radiological examinations are principally based on the vertical distribution of the fall out product ^{137}Cs which has been proved up to a depth of 5300 m. Models to this are briefly presented. Further examinations in the North Sea area (flat shelf sea) as to the distribution of ^{137}Cs, which got into the North Sea by important quantities of waste water from the reprocessing plants in La Hague and Windscale, allow after radiological controls during many years a good insight into the general transport phenomena in this area.

63525 (Juel-Conf—40, pp 73-95) **Radioecology of the deep-sea.** Feldt, W. Nov 1980. (In German). NTIS (US Sales Only), PC A08/MF A01.

From Meeting on deep-sea burial of radioactive wastes; Juelich, F.R. Germany (29 Jan 1980).

The activity released from sea-dumped containers is absorbed by the organism of the benthos and may therefore reach the surface very much faster than it should be expected by vertical diffusion or by currents alone. The density of the biomass has a maximum near the surface, but increases again, according to recent assumptions, directly above the sea-floor resulting in the occurrence of a bottle neck in the distribution between 2000 m and 4000 m of depth. The width of this bottle neck might essentially contribute to the vertical transport. Our knowledge of the conditions in the deep sea is so sparse that quantitative statements on the vertical transport benthos-surface must be regarded as speculations. The different methods of waste disposal (sea-dumping of low- and intermediate-level wastes, and burying of high-level wastes in the sea ground) have got in common the radiation exposure of the abyssal organisms. Their sensitivity to radiation is unknown, and therefore also the disturbance which may be imposed on the abyssal ecosystem. Thus further international research activities on the subject of deep-sea radioecology are necessary before these methods of waste disposal may be considered as safe.

63526 **Behavior and transport of anthropogenic radionuclides in the Peconic River.** Chu, G.R.; Dayal, R. (State Univ. of New York, Stony Brook 11794). *Transactions of the American Nuclear Society;* **39**: 93-95(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

5206 Regulations

REFER ALSO TO CITATION(S) 62763, 63522, 63573, 63574

53 ENVIRONMENTAL-SOCIAL ASPECTS OF ENERGY TECHNOLOGIES

5301 Social And Economic Studies

REFER ALSO TO CITATION(S) 62629, 62673

63527 **(CONF-8010251—Summ.) Energy equity and the elderly: report from a mini-conference of the 1981 White House Conference on Aging.** (National Retired Teachers Association, Washington, DC (USA)). 1980. Contract AI01-81CS21483. 21p. (CONF-8010252—Summ.). NTIS, PC A02/MF A01. Order Number DE82008796.

From Conference on energy equity and the elderly; St Petersburg, FL, USA (28 Oct 1980).

The conference developed recommendations on five energy-related topics: Housing; Economics; Meaningful Roles in the Community, including Employment and Volunteerism; Health Services; and Social Services. (PSB)

63528 **(PNL—4384) Analysis of methods and models for assessing the direct and indirect economic impacts of CO_2-induced environmental changes in the agricultural sector of the US economy.** Callaway, J.M.; Cronin, F.J.; Currie, J.W.; Tawil, J. (Pacific Northwest Lab., Richland, WA (USA)). Aug 1982. Contract AC06-76RL01830. 359p. NTIS, PC A16/MF A01. Order Number DE83000028.

The overall purpose of this research was to assist the US Department of Energy (DOE) in developing methods for assessing the direct and indirect economic impacts due to the effects of increases in the ambient concentration of CO_2 on agricultural production. First, a comprehensive literature search was undertaken to determine what types of models and methods have been developed, which could be effectively used to conduct assessments of the direct and indirect economic impacts of CO_2 buildup. Specific attention was focused upon models and methods for assessing the physical impacts of CO_2-induced environmental changes on crop yields; national and multi-regional agricultural sector models; and macroeconomic models of the US economy. The second task involved a thorough investigation of the research efforts being conducted by other public and private sector organizations in order to determine how more recent analytical methods being developed outside of DOE could be effectively integrated into a more comprehensive analysis of the direct economic impacts of CO_2 buildup. The third and final task involved synthesizing the information gathered in the first two tasks into a systematic framework for assessing the direct and indirect economic impacts of CO_2-induced environmental changes originating in the agricultural sector of the US economy. It is concluded that the direct economic impacts of CO_2 on the agricultural sector and the indirect economic impacts caused by spillover effects from agriculture to other sectors of the economy will be pervasive; however, the direction and magnitude of these impacts on producers and consumers cannot be determined a priori.

5302 Assessment Of Energy Technologies

REFER ALSO TO CITATION(S) 62647, 62673

63529 **(CONF-820250—Summ.) Health and environmental risk-analysis program.** (USDOE Office of Energy Research, Washington, DC. Office of Health and Environmental Research). Jul 1982. 292p. NTIS, PC A13/MF A01. Order Number DE82018085.

From 3. annual contractors' meeting on health and environmental risk and analysis program; Alexandria, VA, USA (16 Feb 1982).

Portions of document are illegible.

This document summarizes the US Department of Energy's (DOE) Annual Health and Environmental Risk Analysis Program (HERAP) Contractor Meeting. It follows the meeting agenda and includes copies of visual aids used by each presenter of information on a 1981 Health and Environmental Effects Document (HEED). New programs and activities of other groups (Sessions III and IV) are not summarized. The panel discussions on generic issues are summarized, and comments of the panel of advisors are provided. Individual papers are indexed for the data base.

55 BIOMEDICAL SCIENCES, BASIC STUDIES

5502 Biochemistry

REFER ALSO TO CITATION(S) 63300, 63535, 63544

63530 Light-dependent delta pH and membrane potential changes in halobacterial vesicles coupled to sodium transport. Kamo, N.; Racanelli, T.; Packer, L. (Membrane Bioenergetics Group, Lawrence Berkeley Laboratory, University of California, Berkeley, California). *Membrane Biochemistry;* **4**: No. 3, 175-188(1982).

Bacteriorhodopsin and Halorhodopsin present in Halobacterium halobium strains have been investigated in relation to Na^+/H^+ exchange in isolated cell envelope vesicles. Upon illumination, these retinal proteins result in extrusion of sodium ions by either an electrogenic Na^+/Ha^+ antiporter and/or a direct sodium pump. Since a molecular characterization of these mechanism(s) of sodium extrusion has not yet been realized, it was of interest to measure directly the light- and sodium-dependent changes in delta pH and membrane potential under nearly identical conditions in S9 and R1mR cell membrane vesicles to gain information on the relation of these retinal proteins to sodium extrusion. These activities were evaluated in terms of their dependence on light intensity, and on the inhibitory effect of chemical modifiers of carboxyl groups (carbodiimides); electroneutral exchanges (monensin and triphenyltin); digitoxin and some analogues; and phloretin. Under most of the conditions and treatments employed, light- and sodium-dependent delta pH led to similar effects in both membrane vesicle types. Hence, it is concluded that the delta pH and delta psi which arise from sodium transport occur by either a single mechanism or by one which shares common features.

63531 Dissociation kinetics of the nuclear estrogen receptor. de Boer, W.; Notides, A.C. (Univ. of Rochester, NY). *Biochemistry;* **30**: 1290-1294(1982).

A method was developed for measuring the [^{3}H]estradiol dissociation of the nuclear estrogen receptor from calf uterine nuclei that were isolated from tissue slices preincubated with [^{3}H]estradiol. The [^{3}H]estradiol dissociation from the nuclear estrogen receptor was a single, slowly dissociating component at 29°C, $k = (6.02 +/- 0.26) \times 10^{-3}$ min^{-1}. The results of the study indicate that the nuclear estrogen receptor has estradiol dissociation kinetics similar to those of the activated form of the cytoplasmic estrogen receptor and there is present a protein factor in the the uterine cytosol that affects the estrogen receptor-nuclear interaction. (JMT)

63532 Dissociation kinetics of the estrogen receptor immobilized by hydroxylapatite. de Boer, W.; Notides, A.C. (Univ. of Rochester, NY). *Biochemistry;* **20**: 1285-1289(1981).

The estrogen receptor from the calf uterine cytosol was adsorbed to hydroxylapatite to provide a simpler and more controlled model for investigating in vitro the [^{3}H]estradiol dissociation kinetics of the estrogen receptor-nuclear complex. The dissociation of [^{3}H]estradiol at 29°C from the estrogen receptor immobilized by hydroxylapatite showed biphasic kinetics with fast and slow components characteristic of the nonactivated and activated states of the receptor, respectively. The hydroxylapatite-immobilized estrogen receptor was useful in investigating the kinetics and mechanism of estrogen receptor activation and serves as a tool for understanding the estrogen receptor-nuclear interactions. (JMT)

5503 Cytology

REFER ALSO TO CITATION(S) 63277, 63556

63533 (LA—9508-MS) High-intensity x-ray holography: an approach to high-resolution snapshot imaging of biological specimens. Solem, J.C. (Los Alamos National Lab., NM (USA)). Aug 1982. Contract W-7405-ENG-36. 125p. NTIS, PC A06/MF A01. Order Number DE83000473.

The crucial physical and technological issues pertaining to the holographic imaging of biological structures with a short-pulse, high-intensity, high-quantum-energy laser were examined. The limitations of x-ray optics are discussed. Alternative holographic techniques were considered, and it was concluded that far-field Fresnel transform holography (Fraunhofer holography) using a photoresist recording surface is most tractable with near term technology. The hydrodynamic expansion of inhomogeneities within the specimen is discussed. It is shown that expansion is the major source of image blurring. Analytic expressions were derived for the explosion of protein concentrations in an x-ray transparent cytoplasm, compared with numerical calculations, and corrections derived to account for the competitive transport processes by which these inhomogeneities lose energy. It is concluded that for the near term Fresnel transform holography, particularly, far-field or Fraunhofer holography, is more practical than Fourier transform holography. Of the alternative fine grain recording media for use with Fresnel transform holography, a photo-resist is most attractive. For best resolution, exposure times must be limited to a few picoseconds, and this calls for investigation of mechanisms to shutter the laser or gate the recording surface. The best contrast ratio between the nitrogen-bearing polymers (protein and the nucleic acids) and water is between the K-edges of oxygen and nitrogen.

63534 Extraction of morphological features from biological models and cells by Fourier analysis of static light scatter measurements. Burger, D.E.; Jett, J.H.; Mullaney, P.F. (Biophysics Group, Los Alamos National Laboratory, University of California, Los Alamos, New Mexico). *Cytometry (Baltimore);* **2**: No. 5, 327-336(Mar 1982).

Models of biological cells of varying geometric complexity were used to generate data to test a method of extracting geometric features from light scatter distributions. Measurements of the dynamic range and angular distribution of intensity and light scatter from these models was compared to the distributions predicted by a complete theory of light scatter (Mie) and by diffraction theory (Fraunhofer). An approximation to the Fraunhofer theory provides a means of obtaining size and shape features from the data by a spectrum analysis. Experimental verification using nucleated erythrocytes as the biological material show the potential application of this method for the extraction of important size and shape parameters from light scatter data.

5504 Genetics

63535 (CONF-820953—1) Macromolecular regulation of sepiapterin and drosopterin synthesis in the purple mutant of Drosophila. Jacobson, K.B.; Yim, J.J.; Wobbe, C.R. (Oak Ridge National Lab., TN (USA); Tennessee Univ., Oak Ridge (USA). Graduate School of Biomedical Sciences). 1982. Contract W-7405-ENG-26. 5p. NTIS, PC A02/MF A01. Order Number DE82022344.

From 7. international symposium on pteridines and folic acid derivatives; St. Andrews, UK (1 Sep 1982).

This study of the mechanism of genetic suppression revealed the existence of a macromolecule which exhibits an inhibitory effect on a mutant form of sepiapterin synthase (probably sepiapterin synthase A) but not on the wild type activity. This inhibitor may be related to the product of the su(s)$^+$ locus. The possibility of purifying and characterizing this su(s)$^+$ substance arises since a simple procedure was developed to measure the extent of inhibition as related to the concentration. (PSB)

63536 **Multiple-locus allocation of individuals to groups as a function of the genetic variation within and differences among human populations.** Smouse, P.E. (Univ. of Michigan, Ann Arbor); Spielman, R.S.; Park, M.H. *American Naturalist;* **119**: No. 4, 445-460(Apr 1982).

Multivariate (multiple-locus) analytic procedures are used to show that the amount of genetic overlap of two or more populations, as measured by the difficulty of correctly allocating individuals, may be formally related to the average genetic distance between pairs of populations. On theoretical grounds, it is argued that the probability of correct allocation for individuals should: 1)increase with the number of segregating loci; 2)increase with increasing taxonomic disparity of the populations considered; and 3)decrease with an increase in the number of candidate populations. Genetic data on 5,214 individuals from seven South American Indian tribes are used to evaluate these theoretical predictions, and the genetic distance and classification with the seven tribes is analyzed. (JMT)

5505 Metabolism

63537 **Phytoplankton photosynthesis and carbon-specific growth: light-saturated rates in a nutrient-rich environment.** Malone, T.C. (Brookhaven National Lab., Upton, NY). *Limnology and Oceanography;* **27**: No. 2, 226-235(Mar 1982). Contract AC02-76CH00016.

Light-saturated photosynthesis from short term (2 h) and daily (24 h) measurements were correlated in phytoplankton of two size fractions, net plankton dominated by diatoms and nanoplankton dominated by chlorophytes. Diurnal variations in short term photosynthesis were characterized by a midday maximum and tended to be a greater amplitude in net plankton than in nanoplankton populations. Nanoplankton photosynthesis varied on a seasonal scale while net plankton photosynthesis varied on a daily scale-a phenomenon which appeared to be reflected in the relationship between short term photosynthesis and growth. The latter, calculated from daily photosynthesis, increased exponentially with temperature and was more closely coupled to short term photosynthesis in nanoplankton than in net plankton populations. These differences seem to be related to the way in which the two size fractions are distributed in time and space as a consequence of interactions between physical process and time-dependent growth.

5506 Medicine

REFER ALSO TO CITATION(S) 63329, 63766

63538 **(BMFT-FB-T—82-001) Radiographic imaging method by gas ionisation.** Eickel, R.; Rheude, A. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Feb 1982. 155p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE82750505.

The search for a substitute of the silver halide film has been intensified worldwide due to the shortage and price increase of silver metal. Gasionography could be an alternative to the wellknown silver film imaging techniques in roentgenology. Therefore the practical basis of the imaging process and the electrophoretic development was investigated. The technical realisation of this method was demonstrated for two different types of X-ray examination by developing a fully automatic film changer and a mammography system that can be adapted to commercially available imaging stands. The image quality achieved with this apparatus was evaluated in comparison with conventional film techniques in the laboratory as well as in a clinical trial.

63539 **(BMFT-FB-T—82-002) Thermoplastic development of electroradiographic charge patterns for medical applications.** Clemens, P.; Goldmann, G.; Storck, E.; Wolff, U. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Jan 1982. 61p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750506.

Ionography and Xeroradiography using toner development are much less sensitive than X-ray recording on screen-film systems. The aim of our work was to find a direct development technique with high sensitivity for electroradiographic charge patterns to obtain a relief pattern on a thermoplastic material. For ionography as well as for xeroradiography new carrier frequency techniques were developed which permit screening the signal charge due to the X-ray without screening the bias charge. Combining suitable plastic and elastic components we adapted the thermal and electric properties of thermoplastics to the special requirements of electroradiography. With some of these optimized materials we achieved a charge sensitivity of 10^{-10} C/cm^2 corresponding to a calculated X-ray sensitivity of 50 μR. However, this X-ray sensitivity could not be achieved experimentally. Due to this and other drawbacks regarding picture quality, resistence to cycling, resolution and aging, we conclude that this technique is not suitable for practical applications.

63540 **(FDA—81-8166) Third international radiopharmaceutical dosimetry symposium.** Watson, E.E.; Schlafke-Stelson, A.T.; Coffey, J.L.; Cloutier, R.J. (comps.). (Bureau of Radiological Health, Rockville, MD (USA)). Jun 1981. Contract AC05-76OR00033. 680p. (CONF-801082—). NTIS, PC A99/MF A01. Order Number DE82012438.

From ORAU radiopharmaceutical dosimetry symposium; Oak Ridge, TN, USA (6 Oct 1980).

Separate abstracts were prepared for 42 of the 48 papers of this proceedings. The remaining six are duplicates of papers already indexed and abstracted. (KRM)

63541 (FDA—81-8166, pp 60-76) **Role of tomography in providing radionuclide distribution and kinetic data.** Budinger, T.F.; Derenzo, S.E.; Huesman, R.H. (Lawrence Berkeley Lab., CA). Jun 1981. NTIS, PC A99/MF A01.

From ORAU radiopharmaceutical dosimetry symposium; Oak Ridge, TN, USA (6 Oct 1980).

A major limitation in radionuclide dosimetry has been the lack of human organ-specific radionuclide distribution and kinetic data because methods of acquiring sequential quantitative information from volumes of interest were not available. Developments in emission computed tomography instrumentation and associated algorithms have overcome this basic limitation, thus allowing in vivo noninvasive tissue distribution studies to be performed. Five aspects of kinetic data acquisition using tomography are: (1) the resolution volume for quantitative work is about two times larger than the system resolution element size as defined by a spread function criterion of full width at half (peak) maximum; (2) scattered radiation might account for 30% of the activity in a given resolution volume and must be taken into account for accurate calculations; (3) proper attenuation compensation must be made to yield quantitative data, particularly with single photon tomography; (4) for dosimetry studies with short half-life labels, multisection systems with dynamic imaging capabilities commensurate with the half-life are needed; (5) the biological conditions such as patient disease and dietary history and the specific activity of the radiopharmaceutical are factors of prime importance in the distribution kinetics.

63542 (FDA—81-8166, pp 77-87) **Positron emission computerized tomography: a potential tool for in vivo quantitation of the distribution of radiopharmaceuticals.** Huebner, K.F. (Oak Ridge Associated Universities, TN); King, P.; Gibbs, W.D.; Washburn, L.C.; Hayes, R.L. Jun 1981. NTIS, PC A99/MF A01.

From ORAU radiopharmaceutical dosimetry symposium; Oak Ridge, TN, USA (6 Oct 1980).

The principles and some of the difficulties in quantitative positron emission computerized tomography have been discussed. It was shown that randoms and scattered events are a major cause of noise and counting errors in positron emission computerized tomography. The noise has been identified as a convoluting process and a mathematical solution has been presented. Examples of phantom studies and in vivo measurements have demonstrated that the distribution of positron emitting radiopharmaceuticals can be quantitated with much improved accuracy using the deconvolution equation to remove undesired noise.

63543 **(UCRL—88102) Computer-generated holograms in medicine.** Perlmutter, R.J.; Friedland, S.S. (Stanford Univ., CA (USA). Information Systems Lab.; Lawrence Livermore National Lab., CA (USA)). 9 Sep 1982. Contract W-7405-ENG-48. 6p. (CONF-821029—2). NTIS, PC A02/MF A01. Order Number DE82020955.

From IEEE Computer Society international symposium on medical imaging and image interpretation; Berlin, F.R. Germany (26 Oct 1982).

Various diagnostic and therapeutic procedures should be considerably enhanced by the presentation of the data from a CT,NMR,PET or ultrasonic scan in holographic form. Initially we demonstrated a holographic presentation using a multiplex white light hologram formed from many x-rays of a cadaver's hand. We have explored various methods of computer generating a hologram and in this paper we report on our method of calculating a Fresnel hologram produced by the superposition of the Fresnel pattern from the individual planes of the CT scan. The limitations of the computer generation of holograms with respect to present and anticipated computer power and recording techniques are presented.

5507 Microbiology

REFER ALSO TO CITATION(S) 63530

5508 Morphology

REFER ALSO TO CITATION(S) 63534

5509 Pathology

REFER ALSO TO CITATION(S) 63300

63544 **Serum and urinary lipoproteins in the human nephrotic syndrome: evidence for renal catabolism of lipoproteins.** Shore, V.G.; Forte, T.; Licht, H.; Lewis, S.B. (Lawrence Livermore National Lab., CA). *Metabolism;* **31**: No. 3, 258-268(Mar 1982). Contract W-7405-ENG-48.

The urinary excretion of lipoproteins and the possibility of catabolic alterations on glomerular filtration were investigated in four nephrotic subjects difering in etiology, serum lipoprotein profile, and 24 hr urinary output of protein and lipids. The apolipoproteins and lipoproteins of urine were compared with those of serum with respect to distribution profile, physical properties, and composition. As expected from molecular sieving effects during glomerular filtration, the urinary HDL were more abundant than the lower density lipoproteins even when the plasma LDL was elevated markedly. Intact apolipoproteins were not found in the concentrated urinary fraction isolated by ultrafiltration between the limits of 10^4 and 5 x 10^4 daltons. On the basis of immunoreactivity, gel electrophoresis, and amino acid composition, apolipoproteins B and AI are the major and minor proteins, respectively, of urinary LDL, and apo B is the major protein of the urinary IDL and VLDL. Apolipoproteins AI, AII, CI, CIII, and possibly AIV were isolated from the urinary HDL. As much as 20% of the protein moiety of the urinary HDL appeared to be large apolipoprotien fragments with molecular weights and isoelectric points similar to those of apo CII and apo CIII. The lower density classes of urinary lipoproteins also appeared to have lost apo E and apo C's and to have undergone partial proteolysis.

5520 Public Health

REFER ALSO TO CITATION(S) 63490

5530 Agriculture And Food Technology

63545 **(CONF-820954—1) Effects of municipal sewage sludge-cake on nitrogen and phosphorus distributions in a pine plantation.** Richter, D.D.; Johnson, D.W.; Ingram, D.M. (Oak Ridge National Lab., TN (USA); Duke Univ., Durham, NC (USA). School of Forestry and Environmental Studies). 1982. Contract W-7405-ENG-26. 15p. NTIS, PC A02/MF A01. Order Number DE82022264.

From 5. Madison waste research conference; Madison, WI, USA (30 Sep 1982).

Anaerobically digested and dewatered sewage sludge-cake was applied at a rate of 275 Mg/ha to a recently clearcut Sequoia silt loam (Typic Hapludult) that was subsequently planted to loblolly pine. The sludge represented an application of about 1500 kg N/ha and 675 P/ha. After four growing seasons N and P distributions were determined in the plant-soil system. Soil solutions were sampled from B horizons in the first and fourth years after treatment to evaluate leaching losses of NO_3^-, NH_4^+, and PO_4^{3-}. Four years after the sludge treatment, differences between sludge-treated and control plots in soil N and P amounted to about 1180 and 868 kg/ha, respectively, in the surface 15 cm of mineral soil. Residual effects persisted for soil-extractable PO_4^{3-}, NO_3^-, and NH_4^+ with 30^-, 10^-, and 1.5-fold increases, respectively, in the surface 15 cm of mineral soil. Concentrations of NO_3^--N in subsoil solutions increased shortly after the sludge treatment, although mean concentrations for individual water collections were not elevated above the USEPA drinking water standard of 10 ppM. Four years after treatment, mean NO_3^--N concentrations in subsoil solutions were less than 2 ppM. Mean concentrations of NH_4^+-N and PO_4^{3-}-P in subsoil solutions did not exceed 1.0 and 0.03 ppM.

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

5601 Radiation Effects

REFER ALSO TO CITATION(S) 63490, 63512, 63540, 63540, 63542, 63766, 63767, 63767, 63768

63546 **(AREAEE—239) Radiation-safety guides for the Inshas electrostatic generator under proton acceleration.** Eid, A.M.; Morsy, S.M. (Atomic Energy Establishment, Inshas (Egypt)). 1980. 21p. Dep. NTIS (US Sales Only), MF A01. Order Number DE82905485.

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The photon dose distribution along the beam direction of the 2.5 MeV electrostatic generator of the Nuclear Physics Department, AEE of Egypt has been measured by different types of detectors. The experiments were carried out under different machine operating conditions while the (p,α) reaction on a ^{59}Co target takes place. In this case detectors of high sensitivity and known energy dependence are required to measure only one sort of radiation (photons). The detectors were located at sites where personnel might possibly be exposed to an adverse amount of radiation. The results afored, give useful estimate of the photon dose distribution at the different Van De Graaff areas.

63547 **(DOE/EV/02014—13) Two-year chronic oral toxicity study with low-dose irradiated papayas in beagle dogs.** (Industrial Bio-Test Labs., Inc., Northbrook, IL (USA)). 6 Jan 1972. Contract AC02-76EV02014. 110p. (COO—2014-13). NTIS, PC A06/MF A01. Order Number DE82021330.

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Results are reported from feeding 15% irradiated or non-irradiated papayas to purebred beagles for two years. The following were recorded: body weight; food consumption and efficiency; behavior; mortality; hematologic and blood chemistry changes; urine analysis; reproduction data; and pathological changes. (PSB)

63548 **(DOE/EV/02014—13-Add.) Two-year chronic oral-toxicity study with low-dose irradiated papayas in beagle dogs.** (Industrial Bio-Test Labs., Inc., Northbrook, IL (USA)). 28 Aug 1973. Contract AC02-76EV02014. 36p. (COO—2014-13-Add.). NTIS, PC A03/MF A01. Order Number DE83000145.

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Upon completion of a two-year chronic oral toxicity study using pure-bred beagle dogs fed diets containing 15% papayas irradiated at either 75,000 or 200,000 rads, additional reproductive studies were performed on dogs - which had displayed poor reproductive results. The dogs were male No. 18 + female No. 22 (75,000 rads), male No. 27 + female No. 32 (proven), and male No. 28 (proven) + female No. 31 (200,000 rads).

63549 **(DOE/EV/02014—14) Three-generation reproduction study with low-dose-irradiated papayas in Swiss white mice: results of all three generations.** (Industrial Bio-Test Labs., Inc., Northbrook, IL (USA)). 21 Oct 1971. Contract AC02-76EV02014. 41p. (COO—2014-14). NTIS, PC A03/MF A01. Order Number DE83000144.

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A two-year chronic and three-generation reproduction study employing Swiss albino mice fed low dose irradiated papayas was conducted. The following results were obtained during the reproduction portion of the experiment. Investigation of the following parameters revealed no differences between test and control animals which could be attributed to the ingestion of low dose irradiated papayas. The following areas were studied: body weight gain; mortality and reactions; hematologic and clinical blood chemistry; pathologic studies; and reproductive performance.

63550 **(DOE/EV/03631—12) Radiation damage and repair in cells and cell components. Radiation-induced repair. Progress report, 1981-1982.** (Duke Univ., Durham, NC (USA). Dept. of Zoology). 1982. Contract AS05-76EV03631. 155p. (ORO—3631-12). NTIS, PC A08/MF A01. Order Number DE83000054.

Portions of document are illegible.

Progress in research on the description and interpretation of radiation-induced repair in cells is reported. It has been found that for the p-recA data induction seems to follow a model of fractional site occupancy rather than being all-or-none. Other areas investigated include: (1) the induction of the RecA-gene product; (2) the effect of uv-phage lambda infection on Rec-A protein synthesis; (3) induced uv radioresistance; (4) cold-shock effects; (5) lambda-prophage induction by x-rays and uv; (6) photoreactivation of uv-induced dimers; and (7) a comparative study of S.O.S. phenomena in various strains of E. coli. (ACR)

63551 (FDA—81-8166, pp 259-282) **Can results from animal studies be used to estimate dose or low dose effects in humans.** Thomas, J.M.; Eberhardt, L.L. (Battelle, Pacific Northwest Lab., Richland, WA). Jun 1981. NTIS, PC A99/MF A01.

From ORAU radiopharmaceutical dosimetry symposium; Oak Ridge, TN, USA (6 Oct 1980).

A method has been devised to extrapolate biological equilibrium levels between animal species and subsequently to humans. Our initial premise was based on the observation that radionuclide retention is normally a function of metabolism so that direct or indirect measures could be described by a power law based on body weights of test animal species. However, we found that such interspecies comparisons ought to be based on the coefficient of the power equation rather than on the exponential parameter. The method is illustrated using retention data obtained from five nonruminant species (including humans) that were fed radionuclides with different properties. It appears that biological equilibrium level for radionuclides in man can be estimated using data from mice, rats, and dogs. The need to extrapolate low-dose effects data obtained from small animals (usually rodents) to humans is not unique to radiation dosimetry or radiation protection problems. Therefore, some quantitative problems connected with estimating low-dose effects from other disciplines have been reviewed, both because of the concern about effects induced by the radionuclide moiety of a radiopharmaceutical and those of the nonradioactive component. The possibility of extrapolating low-dose effects calculated from animal studies to human is discussed.

63552 (FDA—81-8166, pp 447-453) **Transfer of Ga-67 from hamster dam to fetus and offspring.** Hayes, R.L.; Byrd, B.L. (Oak Ridge Associated Universities, TN). Jun 1981. NTIS, PC A99/MF A01.

From ORAU radiopharmaceutical dosimetry symposium; Oak Ridge, TN, USA (6 Oct 1980).

The transfer of Ga-67 from the hamster dam to the fetus and to the postpartum offspring has been studied. During gestation the concentration of Ga-67 in the mammary glands increased by approximately 20-fold, and Ga-67 was transferred across the placenta into the fetus. The concentration of Ga-67 in the fetus decreased during the terminal stages of gestation, partly due to a decreased transfer of Ga-67 itself and partly as the result of the rapid growth of the fetus. One-day-old offspring were able to absorb from the gastrointestinal tract the Ga-67 contained in ingested dam's milk, whereas 9-day-old offspring excreted essentially all such ingested Ga-67. The Ga-67 radiation hazards to the fetus during gestation and that resulting from the transfer of Ga-67 to the newborn through ingestion of the mother's milk should receive further investigation.

63553 (INP—1069/PL, pp 485-513) **Radiobiological and clinical aspects of neutron therapy.** Eichhorn, H.J. (Akademie der Wissenschaften der DDR, Berlin. Zentralinstitut fuer Krebsforschung). 1980. NTIS (US Sales Only), PC A23/MF A01.

From International seminar on isochronous cyclotron technique; Cracow, Poland (13 Nov 1978).

Radiobiological investigations and their interpretation are discussed. The history of neutrontherapy, the results of RBE-investigations in man as well as clinical results are given. The hypothesis on reaction of human tissue and tumours towards neutron irradiation is presented.

63554 **(NUREG/BR—0024) Working safely in gamma radiography. A training manual for industrial radiographers.** McGuire, S.A.; Peabody, C.A. (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Regulatory Research). Sep 1982. 156p. GPO.

Portions of document are illegible.

This manual is designed for classroom training in working safely in industrial radiography using gamma sources. The purpose is to train radiographers' assistants to work safely as a qualified gamma radiographer. The contents cover the essentials of radiation, radiation protection, emergency procedures, gamma cameras, and biological effects of radiation. (ACR)

63555 **(SSA—1981-TS-2) 1980 Scientific works.** (Centre de Recherches du Service de Sante des Armees, 92 - Clamart (France)). Aug 1981. 620p. (In French). NTIS (US Sales Only), PC A99/MF A01. Order Number DE82702684.

Several themes of radiobiology emerged from this progress report. They are as follows: effects of external irradiation on some biochemical parameters used as biological dosemeters (enzymes, amino acids, brain nucleotides, blood cells, blood plasma, etc.); combined effects of irradiation and thermal burns; chemical radioprotection (cysteamine); radiocontamination therapy (DTPA); environmental impact of nuclear power plants (cesium radioecological concentration); physical measurement of irradiation (fluxmetry, dosimetry).

63556 **Induction of chromosome damage by ultraviolet light and caffeine: correlation of cytogenetic evaluation and flow karyotype.** Cremer, C.; Cremer, T.; Gray, J.W. (Biomedical Sciences Division, Lawrence Livermore National Laboratory, Livermore, CA). *Cytometry (Baltimore);* **2**: No. 5, 287-290(Mar 1982).

Asynchronously growing cells of a M3-1 Chinese hamster line were ultraviolet (UV) irradiated (lambda ? 254 nm) with UV fluences up to 7.5 J/m(2). After irradiation cells were incubated with or without 2 mM caffeine for 20 hr, then mitotic cells were selected by mechanical shaking. Their chromosomes were isolated, stained with Hoechst 33258 and chromomycin A3, and measured flow cytometrically. While the fluorescence distributions of chromosomes (flow karyo-types) from cells treated with UV alone or with caffeine alone were very similar to those of untreated controls, the flow karyo-types of UV + caffeine-treated cells showed a debris continuum that increased with increasing UV fluence suggesting an increased number of chromosome fragments. Visual

evaluation of metaphase plates revealed that the percentage of cells with chromosome damage also increased steadily with increasing UV fluence. A high degree of correlation was observed between the relative magnitude of the debris level from flow karyotypes and the percentage of cells with chromosome damage and with generalized chromosomes shattering, respectively, as determined from metaphase spreads.

63557 Quantification of mammalian sperm morphology by slit-scan flow cytometry. Benaron, D.A.; Gray, J.W.; Gledhill, B.L.; Lake, S.; Wyrobek, A.J.; Young, I.T. (Lawrence Livermore National Laboratory, Biomedical Sciences Division, University of California, Livermore). *Cytometry (Baltimore);* 2: No. 5, 344-349(Mar 1982).

The head shapes of mammalian sperm have been measured by slit-scan flow cytometry (SSFCM). In this approach, the distribution of fluorescence along acriflavine stained mammalian sperm is recorded and used as a measure of head shape. Fluorescence profiles were measured for sperm from mice, rabbits, hamsters, and bulls, and for sperm from mice exposed to testicular x-irradiation from 0 to 900 rads. The profiles for sperm from nonirradiated animals were characteristic of each species and were reproducible from sperm to sperm. Some of the fluorescence profiles for sperm from the irradiated mice differed significantly from the profiles usually measured for sperm from exposed mice. An algorithm was developed to determine the frequency of these sperm. The estimated frequencies of atypical profiles correlated well (r ? 0.99) with the frequencies of abnormally shaped sperm determined by microscopic scoring. The maximum SSFCM sensitivity (minimum detectable dose ? 199 rad) was not as high as that for the visual assay (minimum detectable dose ? 116 rad). However, only 100 profiles were measured by SSFCM at each dose while at least 500 sperm were scored visually at each dose. The sensitivity of the SSFCM assay should be increased substantially by measuring more profiles. The objective nature of SSFCM couple with the high correlation with results from the visually based assay of morphology suggests the use of SSFCM to measure frequencies of misshapen sperm when testing for mutagens or monitoring for effects of environmental contaminants.

63558 Wholesomeness studies in rats fed irradiated Indian mackerel (Rastrelliger kanagurta). Nadkarni, G.B. Karlsruhe, Germany; Bundesforschungsanstalt fuer Ernaehrung (1980). 60p.

A 90-day feeding study, including a single reproduction, was undertaken to evaluate the safety of radurized 1.5 kGy (150 krad) Indian mackerel in Wistar rats. Three groups of rats, each consisting of 60 animals, were given the following diets for a period of 90 days: (1) stock laboratory ration; (2) a diet containing 35% unirradiated mackerel powder dried to 8-10% moisture; and (3) a diet containing 35% irradiated mackerel powder dried to 8-10% moisture. The following parameters were evaluated to assess the potential toxic effects: general appearance and any overt signs of toxicity body weight food consumption haematological profile clinical chemistry liver analysis gross pathology absolute and relative organ eights reproductive performance mutagenicity evaluation using (a) Host-mediated assay; (b) Cytogenetic studies on the bone marrow of rats; (c) Dominant lethal test (F_1-generation). In summary, the 90-day feeding study and the single reproduction study in Wistar rats did not show any effect that could be attributed to the ingestion of irradiated mackerel. The difference probably observed between animals fed the stock ration and the mackerel diets arise from the significant variations in the nutritional components, in particular in the protein, of the two diets.

5603 Chemicals Metabolism And Toxicity

REFER ALSO TO CITATION(S) 63519, 63519, 63528

63559 (DOE/EV/02014—17) Two-year chronic oral-toxicity study with low-dose-irradiated papayas in Swiss white mice. (Industrial Bio-Test Labs., Inc., Northbrook, IL (USA)). 25 Oct 1971. Contract AC02-76EV02014. 73p. (COO—2014-17). NTIS, PC A04/MF A01. Order Number DE83000142.

A two-year and three-generation reproduction study using Swiss white mice subjected to chronic oral administration of low-dose-irradiated papayas was conducted. There were no statistical differences in growth, body weight, food consumption, mortality, behavior or blood chemistry between the experimental and control groups. (ACR)

63560 (DOE/EV/10019—8-Vol.2) Environmental and societal consequences of a possible CO_2-induced climate change. Volume II, Part 8. Impacts of rising atmospheric carbon dioxide levels on agricultural growing seasons and crop water use efficiencies. Newman, J.E. (Purdue Univ., Lafayette, IN (USA). Dept. of Agronomy). Sep 1982. Contract AS01-79EV10019. 33p. NTIS, PC A03/MF A01. Order Number DE83001004.

The researchable areas addressed relate to the possible impacts of climate change on agricultural growing seasons and crop adaptation responses on a global basis. The research activities proposed are divided into the following two main areas of investigation: anticipated climate change impacts on the physical environmental characteristics of the agricultural growing seasons and, the most probable food crop responses to the possible changes in atmospheric CO_2 levels in plant environments. The main physical environmental impacts considered are the changes in temperature, or more directly, thermal energy levels and the growing season evapotranspiration-precipitation balances. The resulting food crop, commercial forest and rangeland species response impacts addressed relate to potential geographical shifts in agricultural growing seasons as determined by the length in days of the frost free period, thermal energy changes and water balance changes. In addition, the interaction of possible changes in plant water use efficiencies during the growing season in relationship to changing atmospheric CO_2 concentrations, is also considered under the scenario of global warming due to increases in atmospheric CO_2 concentration. These proposed research investigations are followed by adaptive response evaluations.

63561 (DOE/EV/10019—9-Vol.2) Environmental and societal consequences of a possible CO_2-induced climate change. Volume II, Part 9. Alleviation of environmental stress on renewable resource productivity. Howell, G.S. (Michigan State Univ., East Lansing (USA)). Sep 1982. Contract AS01-79EV10019. 39p. NTIS, PC A03/MF A01. Order Number DE83001006.

It is pointed out that temperature and water stress are the key factors that will be influenced by a rise in ambient CO_2 concentration. Improvement of the capacity of crop plants to withstand water and temperature stress will require an undergirding effort in basic research, to support required advances in plant breeding and development of novel crop management systems. The most important considerations for future research on environmental stress in crops are: the need for interdisciplinary approaches in all aspects of stress research; the need for centralized stress testing capabilities; plant-breeding, the long-term solution with greatest potential benefit and least cost; improvement in management techniques, becoming more effective as increased attention is directed to the management of specific genotypes; the need for understanding of more stress effects closer to the optimum than to lethality; the need to optimize rather than maximize production; the need for understanding different stress effects during different, critical developmental stages; the need for development of usable, physiologically-based crop models to serve as predictive tools for agronomists and breeders; the recognition that improvement options in annual crops are greater than in perennial crops; efforts to culture perennial crops as annuals as a means of avoiding winter stress; and the need for a major effort to devise techniques to shorten the breeding cycle in perennials so that genetic solutions can be more readily employed.

63562 (GSF-OE—629) Ecotoxicology of cadmium. (Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Attaching (Germany, F.R.). Inst. fuer Oekologische Chemie). 1981. 117p. (EUR—7499-EN). Commission of the European Communities, Brussels, Belgium. Environment and Consumer Protection Service.

Cadmium is widely dispersed throughout the environment in different chemical forms and, in general, is present only at low levels. Information is available from various countries on its production, use and consumption, and estimates are made for the European Community as a whole. It is concluded from the available evidence that emission and deposition of cadmium increases from rural to urban to industrial areas. Cadmium is not destroyed by any environmental process. Its transfer pathways in the environment are identified in this report; many of the processes by which it can be transferred are very slow, resulting in retention and possibly accumulation in some parts of the environment. Two mathematical models have been developed to predict future trends in cadmium concentrations. The impact of current levels of cadmium in different ecosystems has been evaluated. With respect to the general population the principal source of cadmium is food. Estimates for the average daily intake vary from country to country and appear to be correlated with the degree of industrialisation. According to various studies made within the European Community and elsewhere, some groups are already at risk. Cadmium present in phosphate fertilisers and sewage sludge will increase levels in soils and is expected to contribute to dietary levels and body burdens. It is necessary to take every opportunity to reduce or to avoid increasing the exposure to cadmium and to take appropriate measures to limit the use of cadmium where there is no adequate substitute.

63563 **(NP—2906143) Effects of cadmium on the embryonal development of Wistar-rats.** Walber, K. (Duesseldorf Univ. (Germany, F.R.). Medizinische Fakultaet). 1979. 44p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82906143.

Thesis.

On days 7-21 of the gestational period rats received a single intraperitoneal injection of $CdCl_2$, each case in a different dose, in order to find out in which embryogenic or fetogenic stage lesions are provoked and appear. In the long-term test obvious malformations were observed after the intraperitoneal administration of $CdCl_2$ on days 7-14 p.c. These anomalies concerned the osseous skull, the skeleton and the eyes. On days 15-21 no malformations became apparent, but a clear increase of intrauterine death could be detected, beginning at the 14. day of the gestational period. In the short-term experiment after the administration of 5.0 mg $CdCl_2$/kg in the presomite stage, on the 9. day lesions of varying severity appeared in individual embryos; these damages comprised all types, beginning with slight necroses in the region of the neurectoderm and mesoderm, up to severe necroses in the area of the entoderm. After the intraperitoneal injection of 2.5 mg $CdCl_2$/kg on the 7. day necroses were found in the zone of the embryoblast. The damage resulting from the injection on the 8. day was only minor. After administering $CdCl_2$ on the 9. day the trophoblast and also the embryoblast were damaged. After the intraperitoneal administration on the 10. day one embryo presented retardation, two other embryos had died. After the intraperitoneal injection on day 11 all embryos had died. In the examinations done after the administration of $CdCl_2$ on the 12. day expanded necroses were found. The marker experiment, made on the 10. day of the gestational period, presented an astonishing high amount of DNA synthesizing cells - not only in the embryos of the control group, but also in those of the test group. In the individual mesenchyma the marker index decreased down to the concentration of 1.25 mg $CdCl_2$/kg only by about 12%; only from 2.50 mg $CdCl_2$ upwards a steep decrease of the silver grain index became apparent. The neurectoderm presented a similar behaviour.

63564 **(NP—2906146) Mercury excretion in older inhabitants of the Western Ruhr district.** Wollhoever, M. (Technische Hochschule Aachen (Germany, F.R.). Medizinische Fakultaet). 15 Feb 1980. 53p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE82906146.

Thesis.

An ecologically affected residential area (study O) of an intensely industrialised large city and a more provincially structured settlement area (study V) were investigated. Persons of the age-classes 1910 until 1914 and of 1965 until 1969 were taken into consideration. The following results were obtained: The analysis of the characteristic 'trembling writing' indicates an affection of the whole population group of study O. However, this result is not confirmed by the other investigations. In some residential areas of the industrialised region of study O, an increase of the mean Hg value found in the urine coincided with the duration of residence. In the discussion of the symptom complex the result of one area of study O hints at an ecologic load. This indication was not confirmed by the other investigations. The residential area 20 of study O presented striking and surprising results. From all that results that a minor influence of the contaminant emission on the state of health of the population of study O with respect to a chronic mercury intoxication is present. The fact that there is a residential area permits the conclusion that this influence bases on local factors.

63565 **(DOE/EV/70257—T1) Oceanic arsenic detoxication: the path of arsenic in marine food chains.** Benson, A.A. (California Univ., San Diego, La Jolla (USA). Marine Biology Research Div.). [nd]. Contract AT03-76EV70257. 11p. NTIS, PC A02/MF A01. Order Number DE82019936.

Arsenate appears to be readily metabolized by all marine algae. Its metabolism and mechanisms for biodegradation of the accumulated arsenolipids was investigated. The objective was to acquire sufficient understanding of the paths of arsenic in marine food chains to be able to evaluate the problems it might present to marine organisms and their effective productivity and the hazards its intermediates might present in marine products for human nutrition. (ACR)

5604 Other Environmental Pollutant Effects

63566 **(NASA-TM—76628) Effects of aircraft noise on the equilibrium of airport residents: testing and utilization of a new methodology.** Francois, J. (National Aeronautics and Space Administration, Washington, DC (USA)). Sep 1981. 34p. NTIS, PC A03/MF A01.

The focus of the investigation is centered around two main themes: an analysis of the effects of aircraft noise on the psychological and physiological equilibrium of airport residents and an analysis of the sources of variability of sensitivity to noise. The methodology used is presented. Nine statistical tables are included, along with a set of conclusions.

57 Health And Safety

REFER ALSO TO CITATION(S) 63338, 63529

58 GEOSCIENCES

63567 **(DOE/ER—0145) Summaries of physical research in the geosciences.** (Department of Energy, Washington, DC (USA). Office of Energy Research). Sep 1982. 116p. NTIS, PC A06/MF A01. Order Number DE82021887.

Portions of document are illegible.

The Department of Energy supports research in the geosciences in order to provide a sound foundation of fundamental knowledge in those areas of earth, atmospheric, and solar-terrestrial sciences that are germane to the Department of Energy's many missions. The participants in this program include the major Department of Energy laboratories, industry, universities, and other governmental agencies. The summaries in this document describe the scope of the individual programs and detail the research performed during 1981 to 1982. The Geosciences Research Program includes research in geology, petrology, geophysics, geochemistry, hydrology, solar-terrestrial relationships, aeronomy, seismology, and natural resource analysis, including the various subdivisions and interdisciplinary areas.

63568 **(ONWI—278) Maximum potential erosion and inundation of seven interior salt domes.** Aronow, S. (Law Engineering Testing Co., Marietta, GA (USA)). Aug 1982. Contract AC06-76RL01830. 20p. NTIS, PC A02/MF A01. Order Number DE83000742.

Seven interior salt domes have been evaluated in regard to erosion or inundation due to natural events. The most likely possibility of either event occurring would be associated with continental glaciation. The domes were evaluated based on maximum previ-

ous sea level changes due to glaciation and effects caused by melting of existing ice sheets. Results are listed for each of the seven domes. Past history indicates a likelihood of returning to a glacial period. The subsequent fall of sea level may cause regrading of streams in the area. A conservative evaluation of this phenomenon was performed and the results are reported.

5801 Geology And Hydrology

REFER ALSO TO CITATION(S) 62634, 62723

63569 (NP—2906028) Tin mineralization and related geology, Coosa County, Alabama. Schrader, E.L.; Tull, J.F.; Stow, S.H. (Alabama Univ., University (USA). School of Mines and Energy Development). Feb 1981. 51p. NTIS, PC A04/MF A01.

Portions of document are illegible.

The Alabama tin belt was studied to determine the relationship of the tin mineralization to the deformational history and igneous intrusives of the area. Studies included thin section modal analyses, polished section observations, biotite and feldspar mineral separate analyses, whole rock major- and minor-element analyses, quantitative Sn determination in rock and mineral samples, and electron-microprobe mineral analyses. (ACR)

5802 Geophysics

REFER ALSO TO CITATION(S) 62633

5803 Mineralogy, Petrology, And Rock Mechanics

REFER ALSO TO CITATION(S) 62723, 63358, 63569

5804 Geochemistry

REFER ALSO TO CITATION(S) 62625, 62626, 62649, 62650, 62651, 62652, 62653, 62654, 62656, 62657, 62658, 62659, 62660, 62661, 62662, 62663, 62664, 62665, 62666, 62667, 62672, 62676, 62677, 62678, 62679, 62683, 62684, 62697, 62701, 62702, 62704, 62705, 62706, 62708, 62713, 62714, 62715, 62716, 62717, 62718, 62719, 62720, 62750, 62771, 63523, 63569

63570 Organic geochemistry of some Cambrian phosphorites. Sandstrom, M.W. (Australian National Univ., Canberra). *Physics and Chemistry of the Earth;* **12**: 123-131(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

The Cambrian sediments in this study consist of unweathered, pelletal phosphorites and associated shales from the Georgina Basin, Queensland, Australia. The organic material associated with these sediments should reflect the unique diagenetic and postdepositional processes associated with the formation of these phosphorites. Gas chromatographic analysis of the saturate fraction of the extractable hydrocarbons and elemental analysis of the kerogen suggests that the hydrocarbons in the phosphorites are the result of intense microbial degradation occurring within the sediments and that the postdepositional history and organic source material for the phosphorites differ markedly from the associated shales.

63571 Pyrolysis-gas chromatographic method for kerogen typing. Larter, S.R.; Douglas, A.G. (Newcastle upon Tyne Univ., England). *Physics and Chemistry of the Earth;* **12**: 579-583(1980). (CONF-7909224—).

From 9. international meeting on organic geochemistry; Newcastle-upon-Tyne, UK (17 Sep 1979).

The classification of kerogens according to their type and rank is important for the definition of any kerogen assemblage. Whereas optical methods of rank determination are well known, vitrinite reflectance and spore coloration being the most widely accepted chemical methods for typing kerogens are less developed. In this work we show that pyrograms, produced by pyrolyzing microgram quantities of solvent-extracted kerogens, enable not only their characterization in terms of a chromatographic fingerprint but also the production of a numerical type index determined as the ratio of m(+p)-xylene/n-octene (oct-1-ene) in the pyrogram. This index appears to be a close function of kerogen type. Type 3 kerogens (Tissot et al., 1974), including vitrinite, provide a high type index and have pyrolysates dominated by aromatic and phenolic compounds whereas type 1 kerogens provide an aliphatic-rich pyrolysate and consequently a low type index. The type index described here correlates well with microscopic and elemental analysis data and the pyrogram fingerprint provides an additional level of characterization not attainable with other current typing techniques.

5805 Oceanography

63572 (AD-A—095300) Trace element geochemistry of marine biogenic particulate matter. Collier, R.W. (Woods Hole Oceanographic Institution, MA (USA)). Feb 1981. 304p. NTIS, PC A14/MF A01.

Plankton samples were investigated for physical and chemical leaching decomposition to identify the major and trace element composition of particulate carrier phases. The identification of trace element/major element ratios in the biogenic materials was emphasized. The majority of the trace elements in the samples were directly associated with the nonskeletal organic phases of the plankton. Calcium carbonate and opal were not significant carriers for any of the trace elements studied. A refractory phase containing Al and Fe in terrigenous ratios was present in all samples, even from the more remote marine locations.

63573 (GAO/CED—82-82) Better planning can reduce size of wastewater treatment facilities, saving millions in construction costs. Bowsher, C.A. (General Accounting Office, Washington, DC (USA). Office of the Comptroller General). 8 Jul 1982. 41p. General Accounting Office, PO Box 6015, Gaithersburg, MD 20760.

Well-planned wastewater treatment plants are crucial to the success of the Nation's multibillion dollar effort to clean up thousands of miles of contaminated rivers, lakes, streams, and ocean shorelines. GAO found that millions of dollars in federal construction grant funds could be saved by applying current regulations - which restrict the size of plants and ultimately the cost to construct them - to treatment plants not yet under construction that were planned under old regulations. GAO recommends that the Congress direct the Administrator of the Environmental Protection Agency to modify the Agency's current policy prohibiting retroactive application of program regulations to projects not yet under construction.

63574 (GAO/CED—82-108) Need to strengthen coordination of ocean pollution research. (General Accounting Office, Washington, DC (USA). Community and Economic Development Div.). 14 Jul 1982. 17p. General Accounting Office, PO Box 6015, Gaithersburg, MD 20760.

Report to the Secretary of Commerce.

The National Ocean Pollution Planning Act of 1978 designated the National Oceanic and Atmospheric Administration (NOAA) as lead agency for preparing and periodically revising a plan to coordinate and direct federal ocean pollution research - an activity scattered throughout the Government. GAO found that while NOAA has made progress toward implementing the act, the plan has had little impact on ocean pollution research. GAO recommends that the National Ocean Pollution Planning Act be amended to increase the ability of NOAA or an appropriate interagency committee to coordinate research and that future revisions of the plan provide clearer direction for the course and organization of the federal research effort.

63575 (NASA-TM—76626) Laser induced fluoresence from algae: results of a ship-borne field test. Hartmann, B.; Steinvall, O.; Widen, A. (National Aeronautics and Space Administration, Washington, DC (USA)). Sep 1981. Translation of FOA-C—30171-EL. 44p. NTIS, PC A03/MF A01.

A basis is provided for the feasibility of air-borne laser fluorosensing not only of chlorophyll but also of pollutants such as oils and chemicals. There was a satisfactory correlation between the laser data and those obtained manually. The absolute determination of the chlorophyll concentration is discussed.

64 PHYSICS RESEARCH

6401 Astrophysics And Cosmology

REFER ALSO TO CITATION(S) 63646

63576 **(LA-UR—82-2333) Radial and nonradial periods of Delta Scuti.** Clancy, S.P.; Cox, A.N. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 6p. (CONF-8206101—9). NTIS, PC A02/MF A01. Order Number DE82021770.

From Conference on pulsations in classical and cataclysmic variable stars; Boulder, CO, USA (1 Jun 1982).

Five periods have been discussed by Smith (1981) for the prototype variable star δ Scuti. The main one, at 0.193772 day, has long been identified as the radial fundamental mode. The others have not been clearly understood, but the second radial overtone is probably the correct identification for the 0.116366 day period. The other three at 0.186891, 0.189435, and 0.211157 day seem to be nonradial modes because of their long periods. The first of these seems to have l = 2 and m = -2 as observed by Smith. Table 1 gives these observed periods. Based on the Fitch (1981) nonradial pulsation constants, the 4.48 hour (.187 day) period seems to be a p_1 mode, but as we shall see, we find that this identification is not very certain. The goal of this paper is to use our nonradial nonadiabatic computing program to predict periods in this range for a model matching the observed parameters of δ Scuti and to identify all five periods.

63577 **(LA-UR—82-2349) Linear theory radial and nonradial pulsations of DA dwarf stars.** Starrfield, S.; Cox, A.N.; Hodson, S.; Pesnell, W.D. (Los Alamos National Lab., NM (USA)). 28 Jul 1982. Contract W-7405-ENG-36. 6p. (CONF-8206101—6). NTIS, PC A02/MF A01. Order Number DE82021777.

From Conference on pulsations in classical and cataclysmic variable stars; Boulder, CO, USA (1 Jun 1982).

The Los Alamos stellar envelope and radial linear non-adiabatic computer code, along with a new Los Alamos non-radial code are used to investigate the total hydrogen mass necessary to produce the non-radial instability of DA dwarfs. (GHT)

63578 **(N—82-16109) Arcsecond positions for milliarcsecond VLBI nuclei of extragalactic radio soures. Part 1. 546 sources.** Morabito, D.D.; Preston, R.A.; Slade, M.A.; Jauncey, D.L. (Jet Propulsion Lab., Pasadena, CA (USA)). Dec 1981. 12p. NTIS, PC A16/MF A01.

In Telecommunications and data acquisition report, 15 December 1981, pp 37-48 see N82-16101.

Very long Baseline Interferometry measurements at 2290 MHz on baselines of approximately 10 to the 4th power km between Deep Space Network stations were used to identify sources that are suitable for precision astrometric applications. The use of relatively crude time delay measurements along with fringe frequency measurements to determine the positions of the milliarcsecond nuclei in 546 extragalactic sources with accuracies of generally approximately 1′ is described. The calculated positions of the sources and the corresponding uncertainties are presented and the positions are referenced to the equinox of 1950.0 and elliptical aberration terms are included so as to agree with past astronomical convention. The source positions and position uncertainties for sources which were multiply observed were estimated from a weighted average. The reliability of the determined positions was demonstrated by testing the repeatability of multiple observations on the same source and by position comparisons with more accurate radio catalogs.

63579 **(N—82-16967) Astronomical Society Information No. 50. Reports of the scientific meetings.** (Astronomische Gesellschaft, Hamburg (Germany, F.R.)). 1980. 176p. (In German and English). NTIS, PC A09/MF A01.

Topics considered include: (1) the dynamics of molecular gas in the galactic center, (2) the galactic center and Aquila regions near infrared, (3) a Fokker-Planck model for the stellar initial mass function, (4) far-infrared balloon-borne observatories, (5) the hydrostatic equilibrium of interstellar gas and magnetic fields in the 6 kpc region of the Galaxy, (6) solar rotation and activity in the past and their possible influence upon the evolution of life, and (7) the generation of spiral waves in galaxies. For individual titles, see N82-16968 through N82-16974.

63580 **(N—82-16970) Dynamics of molecular gas in the galactic center.** Guesten, R.; Downes, D. (Astronomische Gesellschaft, Hamburg (Germany, F.R.)). 1980. 3p. NTIS, PC A09/MF A01.

In Astronomical Society Information No. 50, 1980, pp 76-79 see N82-16967.

Results of a 6 cm H2CO survey in the galactic center region are briefly summarized. Three giant molecular clouds at velocities of + 20, + 40, and + 25 km/s were seen in absorption against the continuum sources of the galactic center region. The high hydrogen-to-formaldehyde column density in the 20 km/s cloud yields 2.2 microns extinction of 5 < A sub 2.2 microns < 10 magnitudes. The H2CO maps and the submillimeter and HCN observations are compared, indicating that the + 40 km/s cloud lies on the far side of the galactic center between Sgr A West and Sgr A East. Stabilizing the clouds against tidal disruption is explained.

63581 **(N—82-16971) Solar rotation and activity in the past and their possible influence upon the evolution of life.** Geyer, E.H. (Observatorium Hoher List, Bonn (Germany, F.R.)). 1980. 3p. NTIS, PC A09/MF A01.

In Astronomical Society Information No. 50, 1980, pp 101-104 see N82-16967.

Observations of enhanced spot active main sequence stars of solar type led to the formulation of the hypothesis which states that the rotational angular momentum, J/sub r/, of stars with spectral types later than F5 determines the intensity of their magnetic activity, bar A. Such very spot active stars are exclusively found as the components of fairly close binary stars, and show rotation periods smaller or more or less synchronous to the orbital period. Single stars of the lower main sequence are generally slow rotators, and do not show detectable activity in optical spectral regions, similar to the Sun if observed from stellar distances.

63582 **(N—82-16973) Hydrostatic equilibrium of interstellar gas and magnetic fields in the 6 kpc region of the galaxy.** Fuchs, B.; Spreckels, H.; Thielheim, K.O. (Astronomische Gesellschaft, Hamburg (Germany, F.R.)). 1980. 4p. NTIS, PC A09/MF A01.

In Astronomical Society Information No. 50, 1980, pp 156-160 see N82-16967.

A two-component gas model is applied to the vertical hydrogen distribution in the 6 kpc region of the Galaxy. Galactic gravitational field and interstellar magnetic field determination of the dynamics of interstellar gas is reviewed.

63583 **(N—82-16974) Generation of spiral waves in galaxies.** Thielheim, K.O. (Astronomische Gesellschaft, Hamburg (Germany, F.R.)). 1980. 3p. NTIS, PC A02/MF A01.

In Astronomical Society Information No. 50, 1980, pp 161-164 see N82-16967.

The literature of 'gravitational' density wave theory is reviewed. The theory's basic assumption, that the spiral pattern is generated by the mutual gravitational interaction of stars inside stellar disks, is examined. N-body simulations were performed. The gravitational field inside the fictitious galaxy was determined by a central oval mass distribution, which was allowed to increase slowly with time as by accretion of stars from the surrounding disk. The gravitational field was determined by an axial symmetric background, consistent with the initial mass distribution of stars inside the disk. Nevertheless, long-living spiral shaped trailing density waves were found again. It is conjectured that the oval shaped equilbrium configuration found in N-body simulation is what is otherwise observed as elliptical galaxies.

63584 **(N—82-16976) Isotopic anomalies and the early history of the solar system.** Begemann, F. (Max-Planck-Institut fuer Chemie (Otto-Hahn-Institut), Mainz (Germany, F.R.)). 1981. 14p. NTIS, PC A08/MF A01.

In Astronomical Society Information No. 51, 1981, pp 49-62 see N82-16975.

Isotopic heterogeneities found in carbonaceous chondrites are discussed in some detail. Specifically, three elements are considered: (1) inclusions from carbonaceous chondrites contain quite normal minerals where the oxygen is enriched by up to 5% in 16O; (2) the xenon in acid unsoluble residues from carbonaceous chondrites contains at least two distinct anomalous components; and (3) neon being more than 99% pure Ne is most convincingly accounted for by in situ decay of 2.6a Na which implies a condensation of Na bearing host phases within ten years or so of the production of Na.

63585 (N—82-16979) Early phases of stellar formation. Tscharmuter, V.M. (Max-Planck-Institut fuer Physik und Astrophysik, Garching (Germany, F.R.). Inst. fuer Astrophysik). 1981. 13p. (In German and English). NTIS, PC A08/MF A01.

In Astronomical Society Information No. 51, 1981, pp 103-106 see N82-16975.

Processes that promote gravitational collapse and star formation in interstellar clouds are discussed. For example, the increase of the external pressure by passing through the galactic shock, or by compression due to an expanding HII region, supernova shell, etc., may cause a cloud to become gravitationally unstable. Obstacles to star formation are mentioned: thermal pressure, angular momentum, and magnetic fields. Processes are proposed to solve the angular momentum problem. In addition to magnetic braking of rotating clouds, magnetic fields are shown to stabilize clouds very effectively. From these properties some speculative conclusions concerning the initial conditions for the presolar nebula and the formation of the cometary cloud are drawn. Numerical examples carried out for self gravitating flows in two and three spatial dimensions are given. They indicate the possibility of converting a cloud's spin into orbital angular momentum by a special fragmentation process. Thus the angular momentum problem is solved by the formation of a binary (or multiple) stellar system. Models including angular momentum transport by turbulent friction and then application to the theoretical evolution of the solar nebula are also briefly mentioned.

63586 (N—82-16997) Evolution of nucleosynthesis of massive POP 111 stars. Ober, W.W.; ElEid, M.; Fricke, K.J. (Astronomische Gesellschaft, Hamburg (Germany, F.R.)). 1981. 2p. NTIS, PC A08/MF A01.

In Astronomical Society Information No. 52, 1981, pp 118-119 see N82-16986.

Observations of the oldest stars in the galactic halo and in metal-deficient globular clusters show evidence of heavy elements in their atmospheres. The enrichment of primordial material with heavy elements in a pregalactic phase by massive stars was calculated. Results are presented which may be adduced for the interpretation of heavy element abundances in old stars, high redshift quasars, and intergalactic x-ray clusters.

63587 (N—82-16999) Nuclear activity in SO, SBO - galaxy nuclei. Schnur, G.F.O.; Sherwood, W.A. (Astronomische Gesellschaft, Hamburg (Germany, F.R.)). 1981. 2p. NTIS, PC A08/MF A01.

In Astronomical Society Information No. 52, 1981, pp 130-131 see N82-16986.

Thirty-five galaxies were surveyed. Results show that 10 galaxies (29%) show pure-absorption line spectra. In 10 galaxies (29%) the Balmer Lines were detected indicating physical conditions that are difficult to be explained by H II-region like phenomena.

63588 (N—82-17005) Evolution of density perturbation in an open Universe. Rozgacheva, I.K. (AN SSSR, Moscow). 1981. 32p. Academy of Sciences, Moscow, USSR.

The evolution of density perturbations in an open Universe is considered. Numerical computations take into account the presence of the microwave background radiation and massless weakly interacting particles. It is shown that in the case of an open Universe omega H(2) < 0.3 observational data contradict modern theories of the formation of galaxies.

63589 (N—82-17016) Review of ground-based measurements. Angione, R.J. (San Diego State Univ., CA (USA)). Dec 1981. 19p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 11-30 see N82-17014.

Early measurements of the solar constant are described and discussed with particular emphasis on the Smithsonian program. A brief description is given of the monitoring program currently operating at San Diego State.

63590 (N—82-17017) Change in the solar constant between 1968 and 1978. Kosters, J.J.; Murcray, D.G. (Denver Univ., CO (USA)). Dec 1981. 6p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 31-36 see N82-17014.

Solar irradiance measurements made from a balloon on January 27, 1978 and February 10, 1980 show a change of 0.4% over similar measurements made in 1968. This change is greater than the uncertainty of the measurement and is felt to be the result of a change in the solar constant.

63591 (N—82-17018) Variability of the solar output. Froehlich, C. (Physikalisch-Meteorologisches Observatorium, Davos (Switzerland)). Dec 1981. 8p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 37-44 see N82-17014.

A review of solar constant determinations and measurements of its spectral distribution is presented. For the period from 1966 to 1980 a mean value of 1367 Wm-2 was determined. Within the corresponding uncertainty, no significant change of both the integral value and the spectral distribution can be detected. However, short-term solar variations and their spectral dependence were deduced from measurements during four hours on June 20, 1980 from 34 km altitude with amplitudes of + or - 500 ppM at 368 nm, of 200 ppM at 500 nm and + or - 150 ppM at 778 nm. Comparison with simultaneous total irradiance data of the Solar Maximum Mission (SMM) shows a high correlation which indicates the solar origin. The power spectrum shows a weak peak at about 3.2 MHz, which corresponds to the frequency of the 5 minutes solar oscillation.

63592 (N—82-17019) Summary of results from solar monitoring rocket flights. Duncan, C.H. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Dec 1981. 14p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 45-58 see N82-17014.

Three rocket flights to measure the solar constant and provide calibration data for sensors aboard Nimbus 6, 7, and Solar Maximum Mission (SMM) spacecraft were accomplished. The values obtained by the rocket instruments for the solar constant in SI units are: 1367 w/sq m on 29 June 1976; 1372 w/sq m on 16 November 1978; and 1374 w/sq m on 22 May 1980. The uncertainty of the rocket measurements is +- 0.5%. The values obtained by the Hickey-Frieden sensor on Nimbus 7 during the second and third flights was 1376 w/sq m. The value obtained by the Active Cavity Radiometer Model IV (ACR IV) on SMM during the flight was 1368 w/sq m.

63593 (N—82-17020) Solar variability indications from Nimbus 7 satellite data. Hickey, J.R.; Alton, B.M.; Griffin, F.J.; Jacobowitz, H.; Pellegrino, P. (Eppley Lab., Inc., Newport, RI (USA)). Dec 1981. 14p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 59-72 see N82-17014.

The cavity pyrheliometer sensor of the Nimbus 7 Earth Radiation Experiment indicated low-level variability of the total solar irradiance. The variability appears to be inversely correlated with common solar activity indicators in an event sense. The limitations of the measuring system and available data sets are described.

63594 (N—82-17021) Indirect methods for measuring variations of the solar constant. Sofia, S. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Dec 1981. 7p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 73-79 see N82-17014.

The difference between the methods that measure delta S, and those that measure variations in the solar luminosity, delta L, is discussed. It is shown that the past practice of simply relating delta S to delta L by geometrical arguments is not valid because of anisotropy of the solar radiation. It is concluded that direct techniques prove the existence of short-term variability that is fully explainable in terms of the passage of active regions (spots and faculae) on the face of the Sun. The obervations of changes in the solar diameter support the existence of structurally induced variations of the solar luminosity on time scales of tens of years, which are significant in the understanding of climatic variations.

63595 **(N—82-17022) Solar neutrinos.** Bahcall, J.N. (Institute for Advanced Study, Princeton, NJ (USA)). Dec 1981. 13p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 81-83 see N82-17014.

The topics covered include: an overview of the subject of solar neutrinos, a brief summary of the theory of stellar evolution, a description of the main sources of solar neutrinos, a brief summary of the results of the Brookhaven C1-37 experiment, an analysis of the principal solar neutrino experiments, and a discussion of how solar neutrino experiments can be used to detect the collapse of stars in the Galaxy. A description of how the Ga-71 experiment can be used to decide whether the origin of the present discrepancy between theory and observation lies in conventional solar models or conventional physics is presented.

63596 **(N—82-17023) Observed variability in the Fraunhofer line spectrum of solar flux, 1975 to 1980.** Livingston, W.; Holweger, H. (Kitt Peak National Observatory, Tucson, AZ (USA)). Dec 1981. 15p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 95-109 see N82-17014.

Over the five years double-pass spectrometer observations of the Sun-as-a-star revealed significant changes in line intensities. The photospheric component weakened linearly with time 0 to 2.3%. From a lack of correlation between these line weakenings and solar activity indicators like sunspots and plage, a global variation of surface properties is inferred. Model-atmosphere analysis suggests a slight reduction in the lower-photospheric temperature gradient corresponding to a 15% increase in the mixing length within the granulation layer. Chromospheric lines such as Ca II H and K, Ca II 8543 and the CN band head weaken synchronously with solar activity. Thus, the behavior of photospheric and chromospheric lines is markedly different, with the possibility of secular change for the former.

63597 **(N—82-17024) Horizontal and vertical semi-diameters of the sun observed at the Cape of Good Hope (1834-1887) and Paris (1837-1906): a report on work in progress.** Smith, C.; Messina, D. (Naval Observatory, Washington, DC (USA)). Dec 1981. 6p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 111-116 see N82-17014.

Cape and Paris meridian observations of the solar limbs which permit an estimate to be made of the solar semi-diameter were surveyed, sampled, and compared with Greenwich and US Naval Observatory observations. Significant systematic errors were found in the Paris work and have been correlated with changes of instruments and observers. Results from the Cape series indicate that work should continue on the compilation of data from Cape observations of the Sun.

63598 **(N—82-17026) Sclera solar diameter observations.** Hill, H.A.; Caudell, T.P.; Bos, R.J. (Arizona Univ., Tucson (USA)). Dec 1981. 6p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 123-128 see N82-17014.

Focus is given to possible variations in solar luminosity and accurate methods of monitoring it. Aside from direct bolometry, one methodology for this type of research makes use of measurements of the solar diameter and limb darkening function as indirect indicators of the solar luminosity. This approach was reviewed.

63599 **(N—82-17027) Solar radius measurements.** Duvall, T.L., Jr.; Jones, H.P. (Kitt Peak National Observatory, Tucson, AZ (USA)). Dec 1981. 2p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 129-130 see N82-17014.

Preliminary results of measurements made during 1979-1980 are discussed. Variability in the radius measurements of 0.4 pi is found, of unknown origin.

63600 **(N—82-17028) Estimating short-term solar variations by a simple envelope matching technique.** Chan, K.L.; Sofia, S. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Dec 1981. 6p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 131-136 see N82-17014.

A simple matching technique is explained which allows the computaton of the response of the solar surface to perturbations which occur at any depth within the convective envelope of the Sun. This technique was applied to a perturbation of the convective efficiency (alpha-mechanism), and of the non-gas component of the pressure (beta-mechanism) in different regions of the convection zone. The results indicate that either perturbation affects the solar luminosity. However, the alpha-mechanism has little effect in the solar radius, regardless of the location of the perturbed region, whereas the beta-mechanism produces radius changes that become quite large if the location of the perturbed region is deep within the solar convection zone.

63601 **(N—82-17029) Thermal perturbation of the sun.** Twigg, L.W.; Endal, A.S. (Louisiana State Univ., Baton Rouge (USA)). Dec 1981. 6p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 137-142 see N82-17014.

An investigation of thermal perturbations of the solar convective zone via changes in the mixing length parameter were carried out, with a view toward understanding the possible solar radius and luminosity changes cited in the literature. The results show that: (a) a single perturbation of alpha is probably not the cause of the solar radius change and (b) the parameter W = d lambda nR/d lambda nL can not be characterized by a single value, as implied in recent work.

63602 **(N—82-17030) Effects of changes in convective efficiency on the solar radius and luminosity.** Sweigart, A.V. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Dec 1981. 22p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 143-164 see N82-17014.

A sequence of solar models has been constructed in order to investigate the sensitivity of the solar radius and luminosity to small changes in the ratio alpha of the mixing length lambda to the pressure-scale height Hp throughout the solar convective envelope. The basic procedure for determining this sensitivity was to impose a perturbation in alpha within the convective envelope and then to follow the resulting changes in the solar radius delta R and luminosity delta L for the next 10 to the 6th power yrs. These calculations gave the following results. (1) A perturbation in alpha produces immediate changes in the solar radius and luminosity. Initially delta L and delta alpha are related by delta L/L = 0.30 delta alpha/alpha. (2) The value of the ratio w = delta log R/delta log L is strongly time dependent. Its value just after the perturbation in alpha is 6.5 x 10 to the minus 4th power. (3) The ratio H = (delta log L) d delta log R/dt is much less time dependent and is a more suitable means for relating the changes in the solar radius and luminosity. (4) Both of these ratios imply that for any reasonable change in the solar luminosity the corresponding change in the solar radius is negligible.

63603 **(N—82-17032) Evolutionary variations of solar luminosity.** Endal, A.S. (Louisiana State Univ., Baton Rouge (USA)). Dec 1981. 9p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 175-183 see N82-17014.

Theoretical arguments for a 30% increase in the solar luminosity over the past 4.7 billion years are reviewed. A scaling argument shows that this increase can be predicted without detailed numerical calculations. The magnitude of the increase is independent of nuclear reaction rates, as long as conversion of hydrogen to helium provides the basic energy source of the Sun. The effect of the solar luminosity increase on the terrestrial climate is briefly considered. It appears unlikely that an enhanced greenhouse effect, due to reduced gases (NH3, CH4), can account for the long-term paleoclimatic trends.

63604 **(N—82-17033) Seat of the solar cycle.** Gough, D. (Cambridge Univ. (UK)). Dec 1981. 22p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 185-206 see N82-17014.

A discussion of some of the issues raised in connection with the seat of the solar cycle are presented. Is the cycle controlled by a strictly periodic oscillator that operates in the core, or is it a turbulent dynamo confined to the convection zone and possibly a thin boundary layer beneath it? Sunspot statistics are discussed, with a view to ascertaining the length of the memory of the cycle, without drawing a definitive conclusion. Also discussed are some of the processes that might bring about variations delta L and delta R in the luminosity and the radius of the photosphere. It appears that the ratio W = delta lnR/delta lnL increases with the depth of the disturbance that produces the variations, so that imminent observations might determine whether or not the principal dynamical processes are confined to only the outer layers of the Sun.

63605 **(N—82-17034) Short- and long-term variations in the solar constant.** Schatten, K.H. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Dec 1981. 11p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 207-217 see N82-17014.

Short- and long-term variations in the solar constant are examined theoretically. The variations observed by the Solar Maximum Mission, lasting several days and associated with the passage of sunspot groups, strikingly demonstrates the well known lack of a bright ring effect around sunspots. This suggests that sunspot magnetic fields do not simply block the heat flowing upward into the photosphere. Rather, it is suggested that gravitational draining occurs and this cools sunspots and transports downward the heat that would otherwise flow into the photosphere. A model of sunspot temperature with depth shows modest support when compared with the empirical model of Van't Veer. Secular trends in the solar constant may occur and be associated with the influence of the convection zone magnetic field upon convective heat transport. As a start to understanding this problem, the Schwarzschild criterion has been modified to include the effects of magnetic field.

63606 **(N—82-17036) Solar pulsations and long-term solar variability.** Goode, P.R.; Logan, J.D.; Hill, H.A. (Arizona Univ., Tucson (USA)). Dec 1981. 5p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 229-233 see N82-17014.

The seismology of the solar atmosphere is important in relating changes in luminosity to variations in other observables. This approach has already led to the identification of properties which were not previously observed or recognized. Equally important results from solar seismology are expected in the future.

63607 **(N—82-17038) Combined solar and tidal influence in climate.** Bell, P.R. (Oak Ridge Associated Universities, Inc., TN (USA)). Dec 1981. 15p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 241-255 see N82-17014.

To provide an early warning indication of the CO2 warning signal, we are searching for periodic or projectable trends in climate. The strong 20.5 year oscillation in Eastern North American January temperature found by Mock and Hibler shows evidence of a beat between waves with periods of 22.36 (22.21 to 22.55) years and 18.64 (18.45 to 18.79) years with an opposition at about 1880. These are interpreted to be the 22.279 year solar Hale magnetic cycle and the 18.61 year lunar nodal tidal cycle. The lunar nodal cycle is known to produce changes in the sea surface temperature through increased mixing of the mixed layer of the ocean. This beat note is shown to be evident in the Western High Plains drought record of Mitchell, Stockton, and Meko and to provide a better bit to the drought series, especially at the beat oppositions in 1880 and 1770.

63608 **(N—82-17039) Predominant periods in the time series of drought area index for the Western High Plains ad 1700 to 1962.** Bell, P.R. (Oak Ridge Associated Universities, Inc., TN (USA)). Dec 1981. 8p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 257-264 see N82-17014.

The detection of the combined presence of the Hale magnetic sunspot cycle (22.28 years) and the lunar nodal tidal cycle (18.61 years) in both the Eastern North American January air temperatures and the Western US High Plains drought series led to an extended analysis of the Drought Area Index time series. This analysis indicated that the mean dominant period of the drought series should be 20.0 to 20.5 years and that the principal period should be resolvable into two components of about 22.28 and 18.61 years. This note details the successful accomplishment of this task.

63609 **(N—82-17041) Prospectus for a theory of variable variability.** Childress, S.; Spiegel, E.A. (New York Univ., NY (USA). Courant Inst. of Mathematical Sciences). Dec 1981. 19p. NTIS, PC A13/MF A01.

In Variations of the solar constant, pp 273-291 see N82-17014.

It is proposed that the kind of stellar variability exhibited by the Sun in its magnetic activity cycle should be considered as a prototype of a class of stellar variability. The signature includes long periods (compared to that of the radial fundamental model), erratic behavior, and intermittency. As other phenomena in the same variability class we nominate the luminosity fluctuations of ZZ Ceti stars and the solar 160 m oscillation. We discuss the possibility that analogous physical mechanisms are at work in all these cases, namely instabilities driven in a thin layer. These instabilities should be favorable to grave modes (in angle) and should arise in conditions that may allow more than one kind of instability to occur at once. The interaction of these competing instabilities produces complicated temporal variations. Given suitable idealizations, it is shown how to begin to compute solutions of small, but finite, amplitude.

63610 **(N—82-17062) Kinetic theory in astrophysics and cosmology.** Ray, J.R. (Clemson Univ., SC (USA)). Jan 1982. 21p. NTIS, PC A25/MF A01.

In 1981 NASA/ASEE Summer Faculty Fellowship Program. See N82-17043.

Results associated with exact solution of the Einstein-Boltzmann and Einstein-Maxwell-Boltzmann equations are presented. The generalization of Ehler's killing vector approach for the distribution function to charged particles is considered.

63611 **(N—82-17064) Ray tracing studies of Jupiter's magnetosphere.** Six, N.F. (Western Kentucky Univ., Bowling Green (USA)). Jan 1982. 16p. NTIS, PC A25/MF A01.

In 1981 NASA/ASEE Summer Faculty Fellowship Program. See N82-17043.

Ray paths for decametric wavelength radiation in Jupiter's magnetosphere were calculated. The model-dependent raypaths with the Voyager observations were compared. Characteristics of the source regions and the influence of propagation effects were deduced. A three-dimensional ray tracing program was employed to calculate the ray paths. Families of rays were launched at particular angles with respect to the magnetic field lines to generate conical sheets of radiation for various frequencies and various source locations. As the planet's magnetic field rotates, these warped sheets of radiation sweep past the observer, producing signatures in frequency versus time plots. These signatures match some of those found in the Voyager data. The greatest propagation effects occur in and around the source regions in the Io auroral oval.

63612 **(N—82-116975) Formation of compact objects in binary systems.** vandenHeuvel, E.P.J. (Amsterdam Univ. (Netherlands)). 1981. 2p. NTIS, PC A08/MF A01.

In Astronomical Society Information No. 51, 1981, pp 121-122 see N82-16975.

The observational evidence on compact objects in binary systems is summarized. Apart from the massive and the low-mass x-ray binaries, three binary radio pulsars are now known, PSR 1913 + 16, PSR 0656 + 64, and PSR 0820 + 02. The various ways in which compact objects can be formed in interacting binary systems are outlined. Massive interacting binary systems are, after the first phase of mass transfer expected to leave either: (1) Wolf-Rayet binaries, with a wide range of orbital periods, as a result of quasi-conservative mass transfer; or (2) systems with short orbital periods as remnants of highly nonconservative evolution (spiral-in during the first phase of mass transfer). From the fact that over 2/3 of all mass stars are members of binaries with P < or = 10 yrs, it is argued that over 2/3 of all single pulsars are expected to have high runaway velocities, since they originate from disrupted post-spiral-in systems.

63613 **(NASA-CP—2191) Variations of the solar constant.** Sofia, S. (ed.). (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Dec 1981. 285p. NTIS, PC A13/MF A01.

See N82-17014.

The variations in data received from rocket-borne and balloon-borne instruments are discussed. Indirect techniques to measure and monitor the solar constant are presented. Emphasis is placed on the correlation of data from the Solar Maximum Mission and the Nimbus 7 satellites. Abstracts of individual items from the workshop were prepared separately for the data base.

63614 **Radio astronomy.** Shaffer, R.D.; Mccluskey, J.T.; Gulkis, S.; Klein, M.; Kuiper, T. pp 1-3 of Telecommunication and data acquisition report. Pasadena, CA; California Institute of Technology (Oct 1981).

A K-band reflected-wave ruby maser was used on the 64-meter (DSS-43) antenna at the Tidbinbilla Tracking Station, near Canberra, Australia. Spectral line observations were carried out near 22 GHz for water vapor sources and near 24 GHz for ammonia sources. The water vapor observations were made in the direction of known southern OH and H2O maser sources. All of the previously detected water line sources examined were detected. In addition, two new water vapor maser sources were discovered, G301.1+1.1and G308.9+0.1. The spectrum of G301.0+1.1 is presented six ammonia sources were found: G291.3-0.7, G305.4+0.2, G322.2+0.6, G327.3-0.5, G333.6-0.2, and G268.4-0.8. Spectra of two of these sources, G291.3-0.7 (RCW 57) and G305.4+0.2, are presented. Both show clearly the presence of the quadrupole splitting satellite lines that will allow the determination of NH3 optical depths in these clouds.

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REFER ALSO TO CITATION(S) 63567, 63609

63615 **(KGI-PREPRINT—052) Quiet time convection electric field properties derived from keV electron measurements at the inner edge of the plasma sheet by means of GEOS-2.** Hultqvist, B.; Borg, H.; Holmgren, L.A.; Reme, H. . (Kiruna Geofysiska Inst. (Sweden)). Apr 1981. 54p. NTIS, PC A04/MF A01.

An electric field model, with the dusk singular point of the forbidden region boundary at 1500 instead of at 1800 MLT, is in quite good agreement with the observations. Effects due to shielding by the hot plasma of the inner magnetosphere from the convection electric field are quite strong in situations of low disturbance level. The quiet time convection electric field strength at 2100 MLT in the geostationary orbit obtained from this analysis varies in the range 0.15 to 0.3 keV/Re. Six hours earlier or later in the satellite orbit the convection field is four times stronger. Also when the convection field varies, information about its magnitude can be obtained from the keV electron measurements.

63616 **(LA-UR—82-2346) Stability of full-amplitude solutions for RR Lyrae variables.** Hodson, S.W.; Cox, A.N. (Los Alamos National Lab., NM (USA)). 30 Jul 1982. Contract W-7405-ENG-36. 6p. (CONF-8206101—7). NTIS, PC A02/MF A01. Order Number DE82021774.

From Conference on pulsations in classical and cataclysmic variable stars; Boulder, CO, USA (1 Jun 1982).

Since the discovery of numerous double-mode RR Lyrae variables in the globular cluster M15 by Cox, Hodson, and Clancy (1981a and 1983, CHC), double-mode behavior in these Population II variables has made it possible to theoretically determine their masses, composition, and maybe even their evolution direction. The most unusual characteristic of these new double-mode pulsators is that they are found in a narrow range of first overtone periods (P_1=0./sup d/38-0./sup d/43) and period ratios (P_1/P_0=0.746+-0.001), where P_0 is the fundamental mode period. This compares with P_1=0./sup d/41 and P_1/P_0=0.746 for AQ Leonis, the only known field double-mode RR Lyrae star. Recent linear studies by CHC (1981a and 1983) suggest that double-mode behavior in this class of stars results from mode switching between the fundamental (F) and first overtone (1H) radial pulsation modes at the transition line just to the red of the F-mode blue edge.

6403 Atomic, Molecular, And Chemical Physics

REFER ALSO TO CITATION(S) 63307, 63309

63617 **(CONF-820855—3) IFPM theory and coupled-channels calculations of K/sup n/L/sup v/ multiple vacancy distributions in ion-atom collisions.** Becker, R.L.; Ford, A.L.; Reading, J.F. (Oak Ridge National Lab., TN (USA); Texas A and M Univ., College Station (USA)). 1982. Contract W-7405-ENG-26. 2p. NTIS, PC A02/MF A01. Order Number DE82020891.

From International conference on X-ray and atomic inner-shell physics; Eugene, OR, USA (23 Aug 1982).

Multiple L-shell vacancy production in the target can be very copious when the impact parameter, B, is near or within the L-shell radius. Small B values can be selected either by detecting K-shell vacancies (x-ray or Auger satellites (K^1) or hypersatellites (K^2)) or by detecting the projectile at a relatively large scattering angle. There are plentiful data for L-vacancy distributions of satellites, but very few for K^0 or K^3. Until our recent work, the satellite data had been interpreted mainly in terms of a binomial distribution (or product of them) at each B, a model in which the emissions of electrons are statistically independent. For the related problem of electron transfer in coincidence with a K vacancy we have found that, even in the independent Fermi particle model (IFPM), correlation effects from interference of amplitudes grow with the projectile charge, Z/sub p/, and become quite significant for Z/sub p/ ≧ 3. Consequently, we formulated the IFPM theory of multiple vacancy production to investigate the degree of breakdown of statistical independence.

63618 **(DOE/ER/01198—1388) Photoemission spectroscopy of surfaces and adsorbates.** Chiang, T.C.; Kaindl, G.; Himpsel, F.J.; Eastman, D.E. (Illinois Univ., Urbana (USA); Freie Univ. Berlin (Germany, F.R.). Inst. fuer Atom- und Festkoerperphysik; IBM Watson Research Center, Yorktown Heights, NY (USA)). 1982. Contract AC02-76ER01198. 13p. (CONF-820855—2). NTIS, PC A02/MF A01. Order Number DE82021591.

From International conference on X-ray and atomic inner-shell physics; Eugene, OR, USA (23 Aug 1982).

Core level photoelectron spectroscopy is providing new information concerning the electronic properties of adsorbates and surfaces. Several examples will be discussed, including studies of adsorbed rare gas submonolayers and multilayers as well as clean metal surfaces. For rare gas multilayers adsorbed on metal surfaces, the photoelectrons and Auger electrons exhibit well-resolved increases in kinetic energy with decreasing distance between the excited atom and the substrate, allowing a direct labeling of the layers. These energy shifts are mainly due to the substrate screening effects, and can be described well by an image-charge model. For a Kr/Xe bilayer system prepared by first coating a Pd sub-

strate with a monolayer of Kr and then overcoating with a layer of Xe, a thermally activated layer inversion process is observed when the temperature is raised, with Xe coming in direct contact with the substrate. For rare gas submonolayers adsorbed on the Al(111) surface, coverage-dependent core level shift and work function measurements provide information about the adatom spatial distributions, polarizabilities, and dipole moments for the ground and excited states. We have also studied the 2p core level shifts for a clean Al(001) surface relative to the bulk. The shifts have a large contribution from the initial-state effects.

63619 **(DOE/ER/04426—5) Kinetics of elementary atom and radical reactions. Progress report, December 1, 1981-November 30, 1982.** Gordon, R.J. (Illinois Univ., Chicago (USA)). 2 Aug 1982. Contract AC02-77ER04426. 19p. NTIS, PC A02/MF A01. Order Number DE82021050.

Research projects discussed include: the branching ratio for abstraction vs. exchange in the reaction D + HCl; kinetics of O + H_2; energy storage in polyatomic molecules; and optoacoustic measurements of ir absorption and relaxation in large molecules. (GHT)

63620 **(DOE/ER/05399—5) Theoretical studies of excess electrons in fluids: structure and electron transfer. Progress report, August 1981-August 1982.** Kestner, N.R. (Louisiana State Univ., Baton Rouge (USA). Dept. of Chemistry). 1982. Contract AS05-77ER05399. 21p. NTIS, PC A02/MF A01. Order Number DE82021163.

Research reported involved studies of electron transfer reactions, negative water clusters, spin pairing in metal ammonia solutions, water-water interactions, interaction of Hexa aquo iron complexes, and proton transfer.

63621 **(DOE/ER/12032—01) Photon scattering and interaction analysis of interfacial corrosion and catalysis. Technical progress report, 1 February 1982-31 August 1982.** Furtak, T.E. (Rensselaer Polytechnic Inst., Troy, NY (USA). Dept. of Physics). 1982. Contract AC02-82ER12032. 12p. NTIS, PC A02/MF A01. Order Number DE82021041.

Photon spectroscopic techniques are being developed as tools with which to study fundamental and applied problems associated with the composition, structure, and evolution of the metal-electrolyte interface. The main research is built around surface enhanced Raman scattering with differential reflectance and photovoltage spectroscopy as supplementary techniques. All of these techniques are used in situ while the sample is exposed to the electrochemical environment of interest. (GHT)

63622 (INIS-mf—6819, pp 279) **Double-photon decay of 2S-states of heavy muonic atoms.** Almaliev, A.N.; Batkin, I.S. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63623 (INIS-mf—6819, pp 289) **EO-conversion in mesic atoms.** Karpeshin, F.F.; Starodubskij, V.E. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63624 **(IPPJ—532) Charge transfer in collisions of Li-3(+) and Be-4(+) ions with atomic hydrogen at low impact energy.** Ohyama, T.; Itikawa, Y. (Nagoya Univ. (Japan)). Aug 1981. 22p. NTIS, PC A02/MF A01.

Total charge transfer cross sections are calculated for the collisons of Li-3(+) and Be-4(+)ions with H (ls) atoms in th low energy region (E 25 keV/amu). The perturbed-stationary-state method in the impact parameter approximation is used with a basis set of adiabatic one-electron two-center molecular orbitals. For the Li-3(+)-H system, a reasonable is found between the present calculation and the recent experiment.

63625 **(MPIS—9/1980) Investigations of the vibrational and rotational excitation of N2, CO, NO, O2, CO2, CH4, CF4 and SF6 during collision with protons and deuterons at an energy of 9.8 ev.** Gierz, U. (Max-Planck-Institut fuer Stroemungsforschung, Goettingen (Germany, F.R.)). Jun 1980. 207p. (German). NTIS, PC A10/MF A01.

Inelastic collision processes of the class H(+) + AB(O,O) yields H(+) + AB(J,V) + Delta (translation energy), with (J,V) the excited state, were studied, experimentally. The measurements show varying results, in such a way that an unified interpretation is impossible. The strong vibrational excitation of 02 is characteristic. A series of models that deal with energy transmission processes are discussed. Only for NO and 02 do measurements agree, at least qualitatively, with theoretical predictions at hand. Trajectory calculations lead only in rare cases to usable results. Better calculation methods for the systems considered are called for. (ESA)

63626 **(MPIS—26/1979) Measurement of integral excitation cross sections during alkali rare gas collisions.** Joswig, H. (Max-Planck-Institut fuer Stroemungsforschung, Goettingen (Germany, F.R.)). Dec 1979. 97p. (German). NTIS, PC A05/MF A01.

For collisons in the energy range 50 to 10,000 eV, emitted light was measured, and a spectral analysis of the fluorescent light from 1450 to 9000 A was performed. The spectrometer setup and measurement techniques are described. Measurement data collection and processing are discussed, including an error analysis. Experimental results are presented. The diabatic Born approximation for a three-particle model under the influence of electronic excitation is then formulated and used to calculate scattering cross sections. Experimental results are critically reviewed. (ESA)

63627 **(ORNL/CSD/TM—185) MUXS: a code to generate multigroup cross sections for sputtering calculations.** Hoffman, T.J.; Robinson, M.T.; Dodds, H.L. Jr. (Oak Ridge National Lab., TN (USA)). Oct 1982. Contract W-7405-ENG-26. 71p. NTIS, PC A04/MF A01. Order Number DE83000221.

This report documents MUXS, a computer code to generate multigroup cross sections for charged particle transport problems. Cross sections generated by MUXS can be used in many multigroup transport codes, with minor modifications to these codes, to calculate sputtering yields, reflection coefficients, penetration distances, etc.

63628 **Reflection of low energy helium atoms from tungsten surfaces.** Robinson, M.T. (Oak Ridge National Lab., TN (USA). Solid State Div.). *Journal of Nuclear Materials;* **103**: No. 1-3, 525-530(Mar 1982).

From 2. topical meeting on fusion reactor materials; Seattle, WA, USA (9 - 12 Aug 1981).

The computer program MARLOWE (Version 11.5) has been used to simulate the reflection of 8 eV to 1.5 keV helium atoms from monocrystalline, polycrystalline, and amorphous targets of tungsten. The results are compared with recent experiments of van Gorkum and Kornelsen on (001) targets and of Seidman, et al., on (011) targets. The comparisons of calculated and measured ion ranges indicate that the electronic stopping cross section of low energy helium atoms in tungsten is significantly greater than the traditional LSS value. The reflection coefficients calculated for the (001) surface are in fair agreement with experiment.

6404 Fluid Physics

63629 **(LA-UR—82-2343) Phase-space analysis of convection in a ^{3}He - superfluid ^{4}He solution.** Haucke, H.; Maeno, Y. (Los Alamos National Lab., NM (USA); California Univ., San Diego (USA)). 1982. Contract W-7405-ENG-36. 15p. (CONF-8205121—1). NTIS, PC A02/MF A01. Order Number DE82021773.

From CNLS order in Chaos conference; Los Alamos, NM, USA (24 May 1982).

Observations have been made on thermal convection below 1K in a dilute solution of ^{3}He in superfluid ^{4}He contained in a cylindrical cell of aspect ratio $\Gamma = 1.20$. Complicated oscillatory phe-

nomena were observed with a high degree of reproducibility using two temperature sensors. Phase-space analysis suggests a description in terms of strange-attractor dynamics.

63630 **(SAND—82-1355C) Numerical simulation of interface dynamics in capillary-driven porous flow.** Hadley, G.R. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 27p. (CONF-821106—2). NTIS, PC A03/MF A01. Order Number DE82018648.

From Annual meeting of heat transfer and energy conversion; Los Angeles, CA, USA (14 Nov 1982).

We present a numerical simulation of capillary-driven porous flow on the scale of a few hundreds of pore diameters. The simulation moves fluid-fluid interfaces dynamically, based on a computed pressure field. A qualitative comparison is made with a more common modelling approach for a simple imbibition problem.

63631 **(WAPD-TM—1525) Family of iterative procedures for solving the semi-implicit Navier-Stokes difference equations.** Hageman, L.A. (Bettis Atomic Power Lab., Pittsburgh, PA (USA)). Sep 1982. Contract AC11-76PN00014. 105p. NTIS, PC A06/MF A01. Order Number DE82022474.

For incompressible flow problems governed by the Navier-Stokes equations, semi-implicit discretizations of the time variable lead to a coupled system of equations that must be solved at each time point. In this report, a family of iterative procedures for solving this system is derived and preliminary analysis and numerical test results for several members of this family are presented.

6450 High Energy Physics

REFER ALSO TO CITATION(S) 63645

6451 Particle Interactions And Properties - Experimental

REFER ALSO TO CITATION(S) 63655

63632 **(BNL—31783) Rare K-decay experiments.** Bunce, G. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 4p. (CONF-8206116—1). NTIS, PC A02/MF A01. Order Number DE83000266.

From Workshop on division of particles and fields of the APS; Aspen, CO, USA (28 Jun 1982).

There have been a proposal (accepted - E777) and a letter-of-intent to search for $K^+ \rightarrow \pi^+\mu^+e^-$ to a branching ratio better than 10^{-11}. This motivation is to test different types of lepton number conservation - specifically, there is a boson in technicolor models which would allow such decays at a level around 10^{-10}. This note discusses the E777 experiment, reasons for doing the experiment at the AGS, and the prospects for looking for even smaller branching ratios. A level of B.R. $< 4.8 \times 10^{-9}$ (90% C.L.) for $K^+ \rightarrow \pi^+\mu^+e^-$ was achieved in a CERN experiment designed to study Ke4 decay. That experiment used a separated 8×10^4/pulse K^+ beam with a PWC/spark chamber detector and no muon identification. E777 will use an unseparated beam with $2 \times 10^7 K^+$/pulse, PWCs, and muon identification. Cherenkovs will be designed to not misidentify particles, at a reduced efficiency. For example, two counters will be filled with H_2 gas at atmospheric pressure to identify electrons. This reduces delta-ray contamination, at a cost of reduced efficiency for identifying the electrons. They chose a K^+ momentum of 6 Gev/c (and, thus, to do the experiment at the AGS) for good particle identification.

63633 **(BONN-HE—81-25) Review of experimental results on photon-photon interactions.** Wedemeyer, R.J. (Bonn Univ. (Germany, F.R.). Physikalisches Inst.). Nov 1981. 30p. (CONF-810895—14). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750508.

From International symposium on lepton and photon interactions at high energies; Bonn, F.R. Germany (24 Aug 1981).

Experimental results on two-photon production of hadronic final states are reviewed. The radiative widths of the resonances eta', f^0, and A_2 have been determined and for the exclusive channels $\pi^+\pi^-$, $\pi^+\pi^-\pi^+\pi^-$, and panti p the cross sections near threshold have been measured. The investigation of inclusive multihadron production has given evidence for a direct, point-like coupling of the photons to quark pairs and for jet production in two-photon collisions. A first measurement of the structure function $F_2(x,Q^2)$ of the photon has been reported.

63634 **(BONN-HE—81-26) Spectroscopy of rho, ω and phi families (from photoproduction and e^+e^- annihilation).** Paul, E. (Bonn Univ. (Germany, F.R.). Physikalisches Inst.). Nov 1981. 33p. (CONF-810895—15). NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750509.

From International symposium on lepton and photon interactions at high energies; Bonn, F.R. Germany (24 Aug 1981).

A review is given of recent results on the vector mesons p^0, ω, phi, and on radial excitations of these states obtained in photoproduction at high energies and in e^+e^- annihilations. New results on J/psi photoproduction are also reported.

63635 **(DESY—81-013) Experimental evidence on QCD.** Soeding, P.; Wolf, G. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Mar 1981. 53p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE82750621.

The authors discuss the experimental results concerning tests of quantum chromodynamics. Especially they consider deep inelastic lepton-nucleon scattering and electron-positron annihilation into hadrons in this framework.

6452 Particle Interactions And Properties - Theoretical

REFER ALSO TO CITATION(S) 63643

63636 **(BNL—31671) Structure of light Λ-hypernuclei and the (K^-, π^-) reaction.** Kahana, S. (Brookhaven National Lab., Upton, NY (USA); CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). 1982. Contract AC02-76CH00016. 6p. (CONF-820635—7). NTIS, PC A02/MF A01. Order Number DE82021758.

From International conference on hypernuclear and kaon physics; Heidelberg, F.R. Germany (20 Jun 1982).

Portions of document are illegible.

A brief description of the procedure and highlights of the calculations performed on a broad range of p-shell nuclei including Λ^9Be, Λ^{12}C, Λ^{13}C, Λ^{14}N and Λ^{16}O for which data exist and Λ^{10}B, Λ^{14}C, Λ^{15}N for which data do not exist are given. The mechanism for the (K^-, π^-) reaction which generates the rich excitation spectra seen experimentally is briefly considered. The use of a relativistic DWBA formalism includes naturally the distortion in K^-, π^- wave functions and permits quantitatively reliable estiamtes of reaction cross-sections to be made. An essentially complete treatment of second-half p-shell nuclei with fixed ΛN and NN potentials is possible because of the small size variations of these nuclei. In principle at least a three body ΛNN force should be present, inducing an apparent nucleon-number dependence in an effective two body interaction. The emphasis is on extraction, from the hypernuclear spectrum and excitation probabilities, of details of the ΛN interaction not otherwise obtainable experimentally. (WHK)

63637 **(BNL—31823) Self-dual Yang-Mills as a totally integrable system.** Chau, L.L. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 6p. (CONF-820871—1). NTIS, PC A02/MF A01. Order Number DE82022046.

From 11. international colloquium on group theoretical methods in physics; Istanbul, Turkey (23 Aug 1982).

The characteristics of a totally integrable system for the self-dual Yang-Mills equations are pointed out: the Parametric Bianchi-Baecklund transformations, infinite conservation laws, the corresponding linear systems, and the infinite dimension Kac-Moody algebra.

63638 **(DESY—81-082) Some rare processes in a model of composite quarks and leptons.** Zhu, Z.Y. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Nov 1981. 11p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82750620.

The branching ratios of some rare processes, i.e. meson → μ e, meson → meson μ e, baryon → baryon μ e, are calculated in a composite quark and lepton model. Use is made of an effective Hamiltonian which originates from hypercolor singlet 0^- and 1^- bound state exchange mechanism, acting at a mass scale Msub(P) and Msub(v) respectively. Under the reasonable assumption Msub(P) = Msub(v) only Ksub(L) → μe puts a significant limit on the composite scale.

63639 **(DESY—81-084) Jets from hadron-, muon-, neutrino interactions in comparison with jets from e^+e^- annihilation.** Haidt, D. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Dec 1981. 36p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750622.

The author gives a review about jets in different interaction processes.

63640 **(FSU-HEP—811201) Low-P/sub T/ hadron production and a valon-parton recombination model.** Amiri, F. (Florida State Univ., Tallahassee (USA). High Energy Physics Lab.). Dec 1981. Contract AS05-76ER03509. 75p. NTIS (US Sales Only). Order Number DE82021938.

Thesis. Portions of document are illegible.

A variant of the recombination model which we call the valon-parton model is applied simultaneously to a variety of meson inclusive reactions with proton, pion and kaon beams in the kinematic region of low transverse momentum and intermediate values of longitudinal momentum fractions. It is found that the valon distributions in hadrons show no evidence for SU(3) breaking. There are some indications of substantial gluon dissociation contributions which we interpreted through a maximally enhanced sea. For proton induced reactions the model predictions are in excellent agreement with the data; meson initiated reactions indicate additional contributions are coming from resonances which are produced recombinantly and then decay into the observed mesons.

63641 **(IFVE-ONF/FTO/PK—81-42) Study of production and decay properties of charmed baryons in neutrino interactions with the SKAT bubble chamber. Proposal for the experiment.** Aleksandrov, G.M.; Ammosov, V.V.; Androsenko, V.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Serpukhov. Inst. Fiziki Vysokikh Ehnergij). 1981. 23p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82701652.

A 500 k picture experiment to study production and decay properties of charmed baryons in neutrino interactions at intensity 4 x 10^{13} ppp using the SKAT bubble chamber filled with a light propan-freon mixture is proposed. Production of approximately 400 charmed baryons in two body reactions nup → μ/(/sub -)(Σ/sub c/)$^{++}$, Σ/sub c//sup *+ +/ in hydrogen will allow to carry out kinematic fitting of these reactions. Furthermore production of approximately 600 V deg events in the mixture, induced by charmed baryons is expected. A study of usual neutrino exclusive reactions in hydrogen is of independent interest.

63642 (INIS-mf—6819, pp 182) **Calculation of sub(Λ)sup(3)H with semirealistic ΛN and NN potentials.** Kolesnikov, N.N.; Kopylov, V.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

6453 Particle Invariance Principles And Symmetries

63643 **(DESY—81-087) Horizontal gauge interactions and CP-violation in the B^0-anti B^0 system.** Montvay, I.; Joshipura, A.S. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Dec 1981. 10p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82750624.

Mass mixing and CP-violation in the Bsup(o)-B^-sup(o) system are calculated in a recently proposed 'horizontal' extension of the standard electroweak theory. The model allows practically complete mixing of Bsup(o)sub(s)-anti Bsup(o)sub(s) with aproximately 10% CP-impurity. The lepton charge asymmetry arising from the semi-leptonic decays of Bsup(o)sub(s) and anti Bsup(o)sub(s), pair produced in e^+e^- annihilation, could be as large as approx. equal to 4% to be constrasted with its small value (< 1%) in the Kobayashi-Maskawa scheme.

6454 Field Theory

REFER ALSO TO CITATION(S) 63635

63644 **(BONN-HE—81-23) Topological charge in the lattice.** Flume, R.; Wyler, D. (Bonn Univ. (Germany, F.R.). Physikalisches Inst.). Oct 1981. 13p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82750510.

We apply Luescher's definition of topological charge for lattice gauge field theories to the two-dimensional massless Schwinger model latticizing the vector field but keeping the fermions in the continuum. The instanton effects induced through fermion bilinears and the ensuing breakdown of cluster decomposition are discussed qualitatively in view of Luescher's concept.

65 PHYSICS RESEARCH

6510 Nuclear Physics

63645 **(CERN—82-01) Photonics applied to nuclear physics. Part 1.** (European Organization for Nuclear Research, Geneva (Switzerland)). 22 Mar 1982. 262p. (CONF-8111108—Pt.1). NTIS (US Sales Only), PC A12/MF A01. Order Number DE82780804.

From European hybrid spectrometer workshop on holography and high-resolution techniques; Strasbourg, France (9 Nov 1981).

Abstracts of individual items from the conference were prepared separately for the data base. (GHT)

63646 **(DOE/ER/40048—18-L2) Nuclear Physics Laboratory annual report 1982.** (Washington Univ., Seattle (USA). Nuclear Physics Lab.). Jun 1982. Contract AC06-81ER40048. 206p. NTIS, PC A10/MF A01. Order Number DE82020187.

Portions of document are illegible.

This Annual Report describes the activities of the Nuclear Physics Laboratory of the University of Washington for the year ending approximately April 30, 1982. As in previous years we report here on a strong nuclear physics research program based upon use of the Laboratory's principal facility, an FN tandem and injector accelerator system. Other major elements of the Laboratory's current program include the hydrogen parity mixing experiment, intermediate-energy experiments conducted at Los Alamos and elsewhere, an accelerator mass spectrometry program emphasizing ^{10}Be and ^{14}C measurements on environmental materials, and a number of researches carried out by Laboratory members working collaboratively at other institutions both in this country and abroad.

63647 **(LA—9468-PR) Applied nuclear data research and development. Semiannual progress report, October 1, 1981-March 31, 1982.** Young, P.G. (comp.). (Los Alamos National Lab., NM (USA)). Aug 1982. Contract W-7405-ENG-36. 88p. NTIS, PC A05/MF A01. Order Number DE83000457.

This progress report describes the activities of the Los Alamos Nuclear Data Group for October 1, 1981, through March 31, 1982. Topics covered include: peripheral effects in R-matrix theory; charged-particle elastic cross sections; energy-angle correlated emission spectra from the D(n,2n)P reaction; new ENDF/B-V evaluation of n+^{7}Li reactions; calculation of proton emission spectra from p+^{91}Zr and p+^{87}Sr reactions; thulium cross-section calculations; production of a new evaluation for natural tungsten

between 0.1 and 20 MeV; application and further development of the improved COMNUC fission model; inelastic cross-section calculations on ^{239}Pu; new calculation of prompt fission neutron spectrum N(E) and average prompt neutron multiplicity anti nu/sub p/; new fission neutron spectrum representation for ENDF; calculation of the prompt neutron spectrum and average prompt neutron multiplicity for the spontaneous fission of ^{252}Cf; calculation of excited-state cross sections for actinide nuclei; NJOY code development; new 80-group fast reactor cross-section library; NJOY covariance modules, ERRORR and COVR; integral data testing of representations of ^{235}U and ^{239}Pu thermal fission spectra; ENDF/B-VI yields; delayed neutron data; CRAY code conversions; calculating fission-product decay-energies and spectra using adjusted data; and calculated neutron sources in Pu process solutions.

63648 **(UCRL—50400-Vol.4-Rev.1-App.C) Neutron Library (ENDL82) in the transmittal format.** Howerton, R.J.; Dye, R.E.; Perkins, S.T. (Lawrence Livermore National Lab., CA (USA)). 26 Jun 1982. Contract W-7405-ENG-48. 5p. NTIS, PC A02/MF A01. Order Number DE82019011.

There are four main libraries of data included within the system described. They are ENDL (Evaluated Neutron Data Library), ECPL (Evaluated Charged-Particle Data Library), ACTL (Evaluated Neutron-Induced Activation Cross-Section Library), and EGDL (Evaluated Photon Interaction Data Library). The first three deal with nuclear processes induced by neutrons or light charged particles ($Z \leq 2$, $A \leq 4$). The fourth (EGDL) contains the data appropriate to photons with energies between 100 eV and 100 MeV that interact with atoms of the elements in their ground state, i.e., cold targets. EGDL does not contain data for photonuclear reactions.

6512 Nuclear Properties And Reactions, A=1-5

63649 (INIS-mf—6819, pp 176) **Calculation of the binding energies and radii for ^{3}H and ^{4}He nuclei accounting for short-range interaction correlations.** Grinyuk, B.E.; Simenog, I.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63650 (INIS-mf—6819, pp 178) **Calculation of ^{4}He nucleus with realistic NN potentials.** Bursak, A.V.; Gorbatov, A.M.; Krylov, Yu.N.; Shein, Yu.L. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63651 (INIS-mf—6819, pp 184) **Phenomenological NN potential for few-nucleon systems with A=2-4.** Kolesnikov, N.N.; Tarasov, V.I. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63652 (INIS-mf—6819, pp 459) **Application of an oscillator basis for study on n-α elastic scattering.** Okhrimenko, I.P.; Polesya, S.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63653 (INIS-mf—6819, pp 468) **Study on the role of triangular diagram in mechanisms of three-particle photofission of alpha particles.** Arkatov, Yu.M.; Vatset, P.I.; Voloshchuk, V.I.; Gur'ev, V.N.; Zolenko, V.A.; Prokhorets, I.M. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63654 (INIS-mf—6819, pp 514) **Polarization and interference effects in deuteron electrofission.** Sokolov, A.A.; Kerimov, B.K.; Ishankuliev, D. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63655 **(LA-UR—82-2622) Parity nonconservation in proton-water scattering at 800 MeV.** Nagle, D.E.; Bowman, J.D.; Carlini, R.; Mischke, R.E.; Frauenfelder, H.; Harper, R.W.; Yuan, V.; McDonald, A.B.; Talaga, R. (Los Alamos National Lab., NM (USA); Illinois Univ., Urbana (USA); Princeton Univ., NJ (USA); Maryland Univ., College Park (USA)). 1982. Contract W-7405-ENG-36. 6p. (CONF-820941—2). NTIS, PC A02/MF A01. Order Number DE83000332.

From 5. international symposium on high energy spin physics; Brookhaven, NY, USA (16 Sep 1982).

A search has been made for parity nonconservation in the scattering of 800 MeV polarized protons from an unpolarized water target. The result is for the longitudinal asymmetry, A/sub L/ = $+(6.6 +- 3.2) \times 10^{-7}$. Control runs with Pb, using a thickness which gave equivalent beam broadening from Coulomb multiple scattering, but a factor of ten less nuclear interactions than the water target, gave A/sub L/ = $-(0.5 +- 6.0) \times 10^{-7}$.

6513 Nuclear Properties And Reactions, A=6-19

REFER ALSO TO CITATION(S) 63636, 63655

63656 (INIS-mf—6819, pp 166) **Calculation of the deformed nucleus electromagnetic properties in the simplex collective model.** Asherova, R.M.; Smirnov, Yu.F.; Tolstoj, V.N.; Shustov, A.P. 1981. (In Russian). Dep. NTIS (US Sales Only).

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63657 (INIS-mf—6819, pp 175) **Study on the collective excitations of ^{18}O and ^{18}Ne nuclei by the unified hypergeometric function method.** Ovcharenko, V.I.; Okhrimenko, I.P.; Steshenko, A.I. 1981. (In Russian). Dep. NTIS (US Sales Only).

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63658 (INIS-mf—6819, pp 245) **Monopole and octupole form factors of ^{16}O.** Gul'karov, I.S.; Karimov, M.G. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63659 (INIS-mf—6819, pp 454) **Quasi-alpha-particle mechanism of double recharging of π mesons on ^{12}C nuclei.** Dzhibuti, R.I.; Kezerashvili, R.Ya. 1981. (In Russian). Dep. NTIS (US Sales Only).

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63660 (INIS-mf—6819, pp 515) **Interference corrections for the second Born approximation to the electron elastic scattering cross section by nuclei with an octupole magnetic moment.** Kerimov, B.K.; Ehl'-Gavkhari, A.; Ganiev, A.G. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63661 (INIS-mf—6819, pp 530) **Spectroscopy of final states in the ^{12}C(π^-, π^+)3α reaction at 170 MeV.** Berdnikov, Ya.A.; Bojko, A.I.; Gismatullin, Yu.R.; Lantsev, I.A.; Melent'ev, A.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63662 (INIS-SU—109, pp 270-276) **Evaluated neutron cross sections and resonance integrals for isotopes with Z=11-31.** Pisanko, Zh.I.; Fedorova, A.F. (AN Ukrainskoj SSR, Kiev. Inst. Yadernykh Issledovanij). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

Evaluated neutron cross sections at Vsub(n)=2200 m/s and resonance integrals of isotopes with Z=11-31 are given.

63663 (KFK—3233) Optical model studies of ^{6}Li elastic scattering at 156 MeV. Cook, J.; Majka, Z.; Gils, H.J.; Rebel, H.; Klewe-Nebenius, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Angewandte Kernphysik 2; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Radiochemie). Nov 1981. 27p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750513.

Differential cross sections for ^{6}Li elastic scattering at 156 MeV from ^{12}C, ^{40}Ca ^{90}Zr and ^{208}Pb are presented. The sensitivity to various potential forms is established by using Saxon Woods, Saxon-Woods-squred, density independent and density dependent folded potentials. The extent to which the experimental data determine the potentials and related quantities is discussed.

6514 Nuclear Properties And Reactions, A=20-38

REFER ALSO TO CITATION(S) 63656, 63662

63664 (DOE/ER/02696—12) Neutron cross section measurements using the ORELA: ^{40}Ar(n,x), ^{40}Ca(n,x), ^{22}Ne(n,γ) ^{187}Os(n,n'), ^{186} ^{187}Os(n,nn'γ), the stable tellurium isotopes (n,γ) and ^{205}Tl(n,nγ). Progress report, September 1, 1981-August 31, 1982. Winters, R.R. (Denison Univ., Granville, OH (USA)). Aug 1982. Contract AC02-76ER02696. 23p. NTIS, PC A02/MF A01. Order Number DE82020994.

Portions of document are illegible.

The research reported is in two major areas, nuclear physics and astrophysics. In nuclear, studies in the use of an optical model nuclear potential to describe the experimentally determined scattering matrix, and reduced neutron widths for s/sub 1/2/ resonances in ^{32}S. In astrophysics, total and capture cross sections for ^{186}Os, ^{187}Os, and ^{188}Os, ^{22}Ne(n,γ) resonances, and capture cross sections for ^{149}Sm, ^{149}Sm, and ^{150}Sm, were measured. (GHT)

63665 (INIS-mf—6819, pp 512) **Alpha particle potentials of the convolution for light deformed nuclei.** Knyaz'kov, O.M. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63666 (INIS-mf—6819, pp 174) **Collective excitation calculation of a ^{20}Ne nucleus by the unified hypergeometric function method using Sp(2, R) basis.** Okhrimenko, I.P.; Steshenko, A.I. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63667 (INIS-mf—6819, pp 53) **Measurement of the lifetime of ^{28}Si excited states using the shadow effect.** Eremin, N.V.; Melikov, Yu.V.; Tulinov, A.F.; Chechenin, N.G.; Yuminov, O.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

6515 Nuclear Properties And Reactions, A=39-58

REFER ALSO TO CITATION(S) 63663

63668 (GKSS—81/E/53) Cross-section determination for the ^{50}Ti(n,p)^{50}Sc reaction in the 14 MeV neutron energy region. Barreira Filho, J.L.; Fanger, H.U. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)). 1981. 16p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82750514.

The cross section for the ^{50}Ti(n,p)^{50}Sc reaction is measured by using the just completed 14 MeV neutron activation facility KORONA of the GKSS Research Center Geesthacht, which is provided with an intense neutron source of cylindrical ion-acceleration structure. The experimentally determined cross-section of 14.3 mb agrees well with recent values found in the literature. Considerations concerning conventional and cyclic neutron activation analysis are included in a theoretical section of this paper.

63669 (INIS-mf—6819, pp 529) **Excitation of collective states in heavy nuclei by intermediate energy pions.** Ponomarev, V.Yu.; Shilov, V.M. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63670 (INIS-mf—6819, pp 223) **Pauli principle and fragmentation of the single-quasi-particle states in odd spherical nuclei with A approximately 55.** Chan Zuj Kkhyong; Voronov, V.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63671 (INIS-mf—6819, pp 231) **Giant E4 resonance in ^{40}Ca.** Zhalov, M.B. 1981. (In Russian). Dep. NTIS (US Sales Only).

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63672 (INIS-mf—6819, pp 238) **Excitation of the giant resonance in ^{40}Ca by 60 MeV protons.** Amus'ya, M.Ya.; Zhalov, M.B. 1981. (In Russian). Dep. NTIS (US Sales Only).

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63673 (INIS-mf—6819, pp 258) **α-decay of the E2-giant resonance in ^{40}Ca.** Kadmenskij, S.G.; Markushev, V.P.; Furman, V.I. 1981. (In Russian). Dep. NTIS (US Sales Only).

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From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

6516 Nuclear Properties And Reactions, A=59-89

REFER ALSO TO CITATION(S) 63663

63675 (INIS-mf—6819, pp 56) **Gamma decay of resonances in proton inelastic scatterng in a particle vibrational model.** Sigalov, V.M.; Kraft, O.E.; Naumov, Yu.V.; Sizov, I.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

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63676 (INIS-mf—6819, pp 229) **Effective interactions in the 1fsub(7/2) nuclear shell.** Kaminski, V.A.; Stashchak, A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63677 (INIS-mf—6819, pp 260) **Internal conversion of gamma rays and toroidal nuclear moments.** Listengarten, M.A.; Feresin, A.P.; Grigor'ev, V.N. 1981. (In Russian). Dep. NTIS (US Sales Only).

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63678 (INIS-mf—6819, pp 272) **Evaluation of minimum period of beta decay of neutron-rich nuclei with 70<A<140.** Lyutostanskij, Yu.S.; Panov, I.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63679 (INIS-mf—6819, pp 276) **Autoionization probability of k-shell of atom in positron beta decay.** Batkin, I.S.; Smirnov, Yu.G.; Churakova, T.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

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63680 (INIS-mf—6819, pp 456) **Possibility of particle preequilibrium escape mainly in the back hemisphere.** Betak, E. 1981. (In Russian). Dep. NTIS (US Sales Only).

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63681 (INIS-mf—6819, pp 474) **Excitation of ΔS=1 charge-exchange giant resonances in proton reactions.** Urin, M.G. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63682 (INIS-mf—6819, pp 59-60) **Study of sup(64, 68)Zn in the (n, n'γ) reaction.** Kaipov, D.K.; Kosyak, Yu.G.; Serebrennikov, A.I.; Chekushina, L.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63683 (INIS-mf—6819, pp 62) **Isomer yields and gamma spectrum of sup(73mg)Se in the ^{70}Ge(α, n) reaction.** Avchukhov, V.D.; Baskova, K.A.; Vasil'ev, S.S.; Krivonogov, Yu.V.; Hakuni, B.M.; Skakun, E.A.; Chugaj, T.V.; Shavtvalov, L.Ya. 1981. (In Russian). Dep. NTIS (US Sales Only).

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63684 (INIS-mf—6819, pp 65-66) **Lifetimes of ^{78}Kr levels.** Andreev, D.S.; Erokhin, K.I.; Lemberg, I.Kh. 1981. (In Russian). Dep. NTIS (US Sales Only).

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63685 (INIS-mf—6819, pp 68) **Three-quasiparticle excitations in ^{81}Kr and ^{81}Br.** Funke, L.; Doring, J.; Kemnitz, P.; Will, E.; Winter, G.; Hildingsson, L.; Johnson, A.; Lindblad, T. 1981. Dep. NTIS (US Sales Only).

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63686 (INIS-mf—6819, pp 70-71) **Angular distributions of gamma quanta in the ^{93}Nb(n, n'γ) reaction.** Avchukhov, V.D.; Baskova, K.A.; Bondarenko, V.A.; Vovk, A.B.; Govor, L.I.; Demidov, A.M. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63687 (INIS-SU—109, pp 306-310) **Evaluation of (n, α) reaction cross section for reactor materials at resonance and intermediate neutrons.** Gledenov, Yu.M.; Balabanov, N.P. (Joint Inst. for Nuclear Research, Dubna (USSR); Plovdivski Univ. (Bulgaria)). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

Cross sections of (n,α) reaction calculated for a number of reactor materials are given in the neutron energy range up to 1 MeV. They can be used for the accumulation estimating of helium in those materials.

63688 (INIS-SU—109, pp 90-94) **Description of fissile nucleus inertia moments in the droplet model.** Adeev, G.D.; Trunova, T.S.; Filipenko, L.A. (Tomskij Politekhnicheskij Inst. (USSR). Inst. Yadernoj Fiziki, Ehlektroniki i Avtomatiki). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

Saddle point configurations and moments of inertia preactinide nuclei with 75<=Z<=85 are calculated in the droplet model. The influence of nonuniformity of nucleon density and diffuseness of nuclear surface were taken into account both in calculations of saddle point configuration and in calculation of moment of inertia.

6517 Nuclear Properties And Reactions, A=90-149

REFER ALSO TO CITATION(S) 63013, 63032, 63664, 63674, 63677, 63678, 63679, 63681

63689 **(BNL-NCS—50640-Ed.4-Suppl.2) Bibliography of integral charged particle nuclear data.** Holden, N.E.; Burrows, T.W. (Brookhaven National Lab., Upton, NY (USA)). Mar 1982. Contract AC02-76CH00016. 72p. NTIS, PC A04/MF A01. Order Number DE83000933.

This publication is the second supplement to the archival edition of the National Nuclear Data Center's charged-particle bibliography. This supplement contains citations to all references scanned since March 15, 1981, and all corrections and additions to previous citations, and indexes all data received in the international exchanged format (EXFOR). The primary goal of the bibliography has been to satisfy the need expressed by the Nuclear Reaction Data Center Network for a concise and comprehensive bibliography of integral charged-particle cross section data and to provide an index of data exchanged among the members. In 1980, coverage was expanded to include differential data relevant to charged-particle-induced neutron-source reactions. (WHK)

63690 (INIS-mf—6819, pp 80) **States of cadmium even isotopes in the interacting boson model.** Zykov, Yu.Yu.; Sychikov, G.I. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63691 (INIS-mf—6819, pp 195) **Self-consistent calculations of high multipolar moments of rare earth nucleus deformation with the Skyrme forces.** Inopin, E.V.; Gonchar, V.Yu.; Tarasov, V.N.; Kirichenko, Yu.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

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63692 (INIS-mf—6819, pp 202) **One type of collective excitations in superfluid Fermi systems.** Krylovetskij, A.G. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63693 (INIS-mf—6819, pp 207) **Existence of the high-lying M1-resonance.** Vdovin, A.I.; Ponomarev, V.Yu.; Stoyanov, Ch.; Shilov, V.M. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63694 (INIS-mf—6819, pp 214) **Structure of low-lying excited states in In isotopes with A=107-115.** Mitroshin, V.E.; Kovrigin, O.D. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63695 (INIS-mf—6819, pp 217) **Unified quasispin model and ^{134}Te and ^{136}Xe nuclear state structure.** Baktybaev, K.B.; Nurlybaev, T.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63696 (INIS-mf—6819, pp 227) **Parameters of effective np interaction for odd-odd In and Sb isotopes.** Alekseev, V.L.; Artamonov, S.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63697 (INIS-mf—6819, pp 257) **Do α-cluster levels exist in heavy nuclei.** Kadmenskij, S.G.; Kurgalin, S.D.; Furman, V.I. 1981. (In Russian). Dep. NTIS (US Sales Only).

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63698 (INIS-mf—6819, pp 281) **Exchange effects in internal conversion process.** Makaryunas, K.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

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63699 (INIS-mf—6819, pp 297) **Analysis of B(E2) ratios for sup(106-110)Cd in the interacting boson model.** Zykov, Yu.Yu.; Sychikov, G.I. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63700 (INIS-mf—6819, pp 97) **New ^{145}Tb and ^{146}Dy isotopes.** Alkazov, G.D.; Afanas'ev, V.P.; Berlovich, E.E. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63701 (INIS-SU—109, pp 250-255) **Calculation of the deformed heavy nuclei cross sections in the framework of statistical model.** Zenevich, V.A.; Klepatskij, A.B.; Kon'shin, V.A.; Sukhovitskij, E.Sh. (AN Belorusskoj SSR, Minsk. Inst. Teplo- i Massoobmena). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The method which allows in the framework of optico- statistical approach with account of fissile and radiation channels to calculate simultaneously neutron cross sections of all types of processes including the cascade reaction cross sections in the 1 keV-15 MeV neutron energy range is discussed.

63702 (KEK—80-14, pp 52-55) **Pion-nucleus reaction in the 3-3 resonance region.** Kobayashi, T. (Tokyo Univ. (Japan). Faculty of Science). Feb 1981. (In Japanese). Dep. NTIS (US Sales Only).

From Workshop on high energy nuclear studies at KEK; Oho, Ibaraki, Japan (16 Dec 1980).

The absorption cross section in pion-nucleus interaction was experimentally obtained. The measurement of emitted gamma-ray was made to estimate the cross section. The contribution of gamma-ray from inelastic scattering was subtracted by the coincidence measurement of pion and gamma-ray. This paper describes the method of measurement of the inelastic scattering. Pions were detected with seven energy-momentum detectors, and gamma-ray was detected with eight NaI scintillation counters. The proper combination of the detectors gave the differential scattering cross section of pions and the differential inelastic scattering cross section. For the scattering angle larger than 90 degree, the main contribution to the total differential scattering cross section is found to be the inelastic scattering. The dispersion S of the gamma-ray multiplicity distribution was twice as much as that of the absorption reaction. The nuclear mass dependence of the inelastic scattering cross section was obtained. The differential inelastic scattering cross section was compared with the cross section of the free scattering process, and it can be said that the main contribution to the inelastic scattering process is the quasi free process. The energy dependence of the effective number of nucleons becomes minimum at the 3 - 3 resonance peak.

63703 **ENDF/B fission product data.** Burrows, T.W.; Rose, P.F. (BNL, Upton, NY 11973). *Transactions of the American Nuclear Society;* **38**: 655-656(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63704 **Status of fission product data for fast and light water reactors.** England, T.R.; Schenter, R.E. (LANL, Los Alamos, NM 87545). *Transactions of the American Nuclear Society;* **38**: 656(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63705 **Lumped fission product cross sections from ENDF/B-V for fast reactor analysis.** Henryson, H. II; Liaw, J.R. (ANL, Argonne, IL 60439). *Transactions of the American Nuclear Society;* **38**: 657-659(1981). (CONF-810606—).

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6518 Nuclear Properties And Reactions, A=150-189

REFER ALSO TO CITATION(S) 63664, 63691

63706 (INIS-mf—6819, pp 655) **Relation of rotational bands in Z-odd nuclei.** Begzhanov, R.B.; Daminov, E.T.; Choriev, B. 1981. (In Russian). Dep. NTIS (US Sales Only).

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63707 (INIS-mf—6819, pp 126) **Calculations of the strength functions of Gamov-Teller β-transitions of odd and odd-odd deformed nuclei.** Bykov, A.A.; Vitman, V.D.; Naumov, Yu.V. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63708 (INIS-mf—6819, pp 208) **Study on the Axel-Brink hypothesis for multipole transitions with lambda <= 3 in deformed nuclei.** Kitipova, V.; Malov, L.A.; Shirikova, N.Yu. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63709 (INIS-mf—6819, pp 293) **Determination of ratios of internal conversion line intensities for gamma radiation of $2^+ \rightarrow 0^+$ transitions in ^{156}Gd and ^{166}Er.** Bulgakov, V.V.; Gavrilyuk, V.I.; Klyuchnikov, A.A.; Lashko, A.P.; Muzalev, P.N.; Strel'chuk, N.V.; Feoktistov, A.I.; Frantsev, Yu.E. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63710 (INIS-mf—6819, pp 294) **Contradaction in the measured quadrupole moments.** Avotina, M.P. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63711 (INIS-mf—6819, pp 115) **Calculations of probabilities of γ transitions in ^{155}Eu.** Guseva, T.V.; Prokof'ev, P.T.; Repshe, E.A.; Tamberg, Yu.Ya. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63712 (INIS-mf—6819, pp 661) **Study of sup(154m)Ho and sup(154)Ho decays.** Zuber, K.; Prazhak, F. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63713 (LBL—14563) **Statistics at work in heavy-ion reactions.** Moretto, L.G. (Lawrence Berkeley Lab., CA (USA)). Jul 1982. Contract AC03-76SF00098. 135p. (CONF-820746—1). NTIS, PC A07/MF A01. Order Number DE82020337.

From Enrico Fermi International School of Physics on nuclear structure and heavy ion dynamics; Varenna, Italy (27 Jul 1982).

In the first part special aspects of the compound nucleus decay are considered. The evaporation of particles intermediate between nucleons and fission fragments is explored both theoretically and experimentally. The limitations of the fission decay width expression obtained with the transition state method are discussed, and a more general approach is proposed. In the second part the process of angular momentum transfer in deep inelastic reactions is considered. The limit of statistical equilibrium is studied and specifically applied to the estimation of the degree of alignment of the fragment spins. The magnitude and alignment of the transferred angular momentum is experimentally determined from sequentially emitted alpha, gamma, and fission fragments.

6519 Nuclear Properties And Reactions, A=190-219

REFER ALSO TO CITATION(S) 63663, 63669, 63674, 63679, 63710, 63713

6520 Nuclear Properties And Reactions, A=220 And Above

REFER ALSO TO CITATION(S) 63032, 63713

63714 (CNEN-RT/FI—81-24) **Evaluation of ^{245}Cm neutron cross sections from 10^{-5} eV to 15 MeV.** Maino, G.; Martinelli, T.; Menapace, E.; Motta, M.; Vaccari, M. (Comitato Nazionale per l'Energia Nucleare, Bologna (Italy). Dipartimento Ricerca Tecnologica di Base ed Avanzata). 1981. 33p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82905932.

Portions of document are illegible.

After a short review of the most important experimental data, Cm-245 neutron cross section evaluation in the energy range 10^{-5} eV to 15 MeV is described. Elastic and inelastic scattering, capture, and fission cross sections are presented.

63715 (INIS-mf—6819, pp 250) **Relation of inclusive spectra with compression dynamics in nuclei collisions.** Kiselev, S.M; Pokrovskij, Yu.E. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63716 (INIS-SU—109, pp 245-249) **Possibility of prediction of neutron radiative capture cross sections by fissile nuclei.** Zenevich, V.A.; Klepatskij, A.B.; Kon'shin, V.A.; Sukhovitskij, E.Sh. (AN Belorusskoj SSR, Minsk. Inst. Teplo- i Massoobmena). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

On a base of comparison of theoretical calculations and experimental data it is concluded that the use of the non-spherical optical potential, the Lorentzian spectral factor, the Fermi- gas level density model involving the collective modes as well as taking into account (n,γf) and (n,γn')-competition permits the self-consistent calculation of radiative capture cross section σΞsub(γ) over a wide energy range.

63717 (INIS-SU—109, pp 256-266) **Evaluation of the neutron cross sections for Cm isotopes.** Belanova, T.S.; Kolesov, A.G. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The brief review of neutron cross section and resonance integral data of the curium isotopes from 242 to 248 for thermal and resonance region energies are represented. The evaluated data are listed in tabular form.

63718 (INIS-SU—109, pp 301-305) **Evaluation of the (n, 2n) reaction cross section for heavy nuclei based on results charged particle investigations.** Andreev, M.F.; Serov, V.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The estimation of (n,2n) reaction cross sections for ^{237}Np and ^{239}Pu in neutron energy range 12.5- 14.5 MeV based on measured cross sections of reactions (t,2n), (d,2n), (t,f), (d,f) was carried out. The estimated cross sections compared with the results of direct measurements σΞn,2n. The fit was obtained in the range of approximately 25%.

63719 (INIS-SU—109, pp 166-170) **Influence of subbarrier nucleon exchange between fission fragments on their mass and charge distributions.** Rubchenya, V.A.; Yavshits, S.G. (Radievyj Inst., Leningrad (USSR)). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

Within the framework of diffusion approximation the process of nucleons exchange between fission fragments near the scission point is treated. The tangent fragments model was used for calculation of coefficients of Fokker-Plank equation and showed that the exchange process may be important in formation of mass and charge distributions.

63720 (INIS-SU—109, pp p 161-165) **Island of stability and shell structure of nuclei.** Zakharova, V.P. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

It is proposed hypothesis: the most probable fragments inherit the shell structure of the primary nucleus. From this hypothesis it follows: superheavy elements in the vicinity of the magic numbers Z=114, N=184 will devide mainly on the fragments, conditioned by the magic numbers Z=82, N=126 and Z=28 (or 32), N=50; their spontaneous fission lifetimes will be near parts of microseconds; the neutron emission per fission anti ν will be near zero. Rough estimations anti ν for neighbouring nuclei are given.

63721 (INIS-SU—109, pp 137-142) **Statistical description of fragment mass distribution in fission of heavy and superheavy elements.** Rubchenya, V.A. (Radievyj Inst., Leningrad (USSR)). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The statistical calculations of mass distributions for fission of nuclei from Ra to Z=116 has been made. The influence of shell structure of fragments is studied. It is established that the character of mass distributions for fission of nuclei from Ra to Fm is determined by nucleon shells Z=50 and N=82 while for fission of transfermium nuclei the influence of these shells disappears.

63722 (INIS-SU—109, pp 119-123) **Integral characteristics of delayed neutrons emitted by fission products.** Kolobashkin, V.M.; Lyutostanskij, Yu.S.; Rubtsov, P.M.; Ruzhanskij, P.A. (Moskovskij Inzhenerno-Fizicheskij Inst. (USSR)). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The AFPA-04 and AFPA-26 programms for the calculation of fission products and actinides concentrations are used for the determination of number of delayed neutrons. The data on the probabilities of delayed-neutrons emission for about 100 nuclei-fission products are used. For a part of the nuclei this data are predicted using the finite Fermi-System theory. Time dependences of delayed-neutrons activity in an interval from 0 to 1000 s for fissionable isotopes: Th-232; U-233,235,236,238; Pu-239,240,241.

63723 (INIS-SU—109, pp 114-118) **Application of the Hauser-Feshbach method for the fission prompt neutron spectrum calculation.** Gerasimenko, B.F.; Rubchenya, V.A.; Pozdnyakov, A.V. (Radievyj Inst., Leningrad (USSR)). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The use of the H-F method for the prompt fission neutron spectra calculation is reported. The calculations were made for the selected fission fragment masses. The influence of the chosen model parameters on the calculations results is considered. The shape of the obtained neutron spectra for the spontaneous fission of $_{98}{}^{252}$Cf are discussed.

63724 (KFK—3220) **Numerical results of a (2E,2v)-measurement for fast neutron induced fission of ^{235}U and ^{237}Np.** Mueller, R.; Naqvi, A.A.; Kaeppeler, F.; Bao, Z.Y. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.)). Dec 1981. 30p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750515.

Numerical results obtained from measurement of fragment properties in fast neutron induced fission of ^{235}U and ^{237}Np are given in tabular form together with figures and a short description of the experiment. A detailed presentation of experiment and data analysis and the discussion of the results is in preparation.

63725 (UCRL—87287) **Neutron-induced fission-cross-section measurements and calculations of selected transplutonic isotopes.** White, R.M.; Browne, J.C. (Lawrence Livermore National Lab., CA (USA); Los Alamos National Lab., NM (USA)). 27 Aug 1982. Contract W-7405-ENG-48. 5p. (CONF-820942—5). NTIS, PC A02/MF A01. Order Number DE82020865.

From Nuclear data for science and technology international conference; Antwerp, Belgium (6 Sep 1982).

The neutron-induced fission cross sections of /sup 242m/Am and ^{245}Cm have been measured over an energy range of 10^{-4} eV to ~ 20 MeV in a series of experiments at three facilities during the past several years. The combined results of these measurements, in which only sub-milligram quantities of enriched isotopes were used, yield cross sections with uncertainties of approximately 5% below 10 MeV relative to the ^{235}U standard cross section used to normalize the data. We summarize the resonance analysis of the /sup 242m/Am(n,f) cross section in the eV region. Hauser-Feshbach statistical calculations of the detailed fission cross sections of ^{235}U and ^{245}Cm have been carried out over the energy region from 0.1 to 5 MeV and these results are compared with our experimental data.

63726 **Thorium S-wave neutron widths from 21 to 2006 eV.** Ingle, R.W.; Olsen, D.K.; Portney, J.L. (ORNL, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **38**: 647-648(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63727 **Fission cross-section measurement of ^{248}Cm.** Block, R.C.; Dabbs, J.W.T.; Harris, D.R.; Hoff, R.W.; Maquire, H.T. Jr.; Slovacek, R.E.; Stopa, C. (RPI, Troy, NY 12181). *Transactions of the American Nuclear Society;* **38**: 648-649(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63728 **Calculation of the prompt neutron spectrum and νp for the spontaneous fission of ^{252}CF.** Madland, D.G. (LANL, Los Alamos, NM 87545). *Transactions of the American Nuclear Society;* **38**: 649-650(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63729 **Representation of the neutron cross sections of several fertile and fissile nuclei in the resonance regions.** de Saussure, G.; Perez, R.B. (ORNL, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **38**: 662(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63730 **Sensitivity coefficients for the ^{238}U neutron capture shielded group cross sections.** de Saussure, G.; Munoz-Cobos, J.L.; Perez, R.B. (ORNL, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **38**: 666(1981). (CONF-810606—).

From American Nuclear Society's annual meeting; Miami Beach, FL, USA (7 Jun 1981).

63731 **Integral testing of evaluated fission product data.** England, T.R.; George, D.C.; LaBauve, R.J.; Wilson, W.B. (LANL, Los Alamos, NM 87545). *Transactions of the American Nuclear Society;* **39**: 757-759(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63732 **Neutron-induced fission yields of 235 U from 0.17 to 8.1 MeV.** Gindler, J.E.; Glendenin, L.E.; Henderson, D.J.; Meadows, J.W. (ANL, Argonne, IL 60439). *Transactions of the American Nuclear Society;* **39**: 877-879(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

6530 Nuclear Theory

REFER ALSO TO CITATION(S) 63693, 63708, 63719

63733 (INIS-mf—6819, pp 510) **Dependence of differential cross sections of various single-step mechanisms on the choice of bound state wave functions.** Belyaeva, T.L.; Zelenskaya, N.S. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63734 (INIS-mf—6819, pp 167) **Taking into account of shape zero oscillations in self-consisktent calculations with the Syrme forces.** Kuprikov, V.I.; Mitroshin, V.E. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63735 (INIS-mf—6819, pp 188) **Rotational spectra in the semiphenomenological nuclear model.** Krutov, V.A.; Mitropol'skij, I.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63736 (INIS-mf—6819, pp 196) **Size and compressibility of nuclei.** Kolesnikov, N.N.; Starostnikov, M.I.; Badaev, O.P. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63737 (INIS-mf—6819, pp 200) **Ghost component in the wave function of a beta-vibrational state.** Abrosimov, V.I. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63738 (INIS-mf—6819, pp 261) **Comparison of internal conversion coefficients, calculated according to different models.** Listengarten, M.A.; Sergeev, V.O. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63739 (INIS-mf—6819, pp 263) **Time dependence of gamma rays resonance scattering processes and on gamma spectra shape, emitted by excited nuclei.** Davydov, A.V.; Romasheva, P.I. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63740 (INIS-mf—6819, pp 269) **Application of method of the induced $\beta\gamma$ correlation of directions in nuclear spectroscopy and in solid-state physics.** Denisenko, G.A.; Sorokin, A.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63741 (INIS-mf—6819, pp 271) **Antineutrino spectrum of neutron-rich nuclei.** Aleksankin, V.G.; Lyutostanskij, Yu.S.; Rubtsov, P.M.; Ruzhanskij, P.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63742 (INIS-mf—6819, pp 294) **Magnetic moments of even-even nuclei.** Avotina, M.P. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63743 (INIS-mf—6819, pp 440) **Large-angle nuclear scattering.** Strutinskij, V.M. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63744 (INIS-mf—6819, pp 451) **Nuclear collisions at 10 MeV per nucleon and preequilibrium processes in nuclei.** Dzholos, R.V.; Ivanova, S.P.; Kartavenko, V.G. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63745 (INIS-mf—6819, pp 452) **About accounting for the coulomb effects in the K matrix formalism of scattering theory.** Dolinskij, E.I.; Mukhamedzhanov, A.M. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63746 (INIS-mf—6819, pp 463) **New method of the scattering amplitude calculation for three charged particle reactions.** Popova, A.M.; Popov, Yu.V.; Erokhin, V.F. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63747 (INIS-mf—6819, pp 469) **Two-nucleon transfer reaction in the dispersion theory.** Abdulvagabova, S.K. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63748 (INIS-mf—6819, pp 517) **Electron elastic and inelastic scattring on nuclear multipole moments in the eikonal approximation.** Dzhavadov, A.V.; Sadykhov, A.R. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63749 (INIS-mf—6819, pp 519) **0.8-1 GeV protons polarization in inelastic scattering with excitation of low-lying nuclear vibrational levels.** Berezhnoj, Yu.A.; Soznik, A.P.; Khomenko, G.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63750 (INIS-mf—6819, pp 523) **Description of process of nucleon knock out from nuclei by intermediate and high-energy protons 2.** Sajler, K.C.; Tartakovskij, V.K. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63751 (INIS-mf—6819, pp 638) **Generalized intensity balance rule with allowance for multiplicity of gamma transitions.** Petrov, B.F. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63752 (INIS-SU—109, pp 282-285) **Simple formulae for (n, p), (n, pn) reaction excitation function calculation.** Bychkov, V.M.; Plyaskin, V.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

On the base of evaporation and exciton models the simple formulae are produced for (n,p) and (n,pn) excitation functions and fission spectrum averaged (n,p) cross sections. The results of calculation are in good agreement with experimental data.

63753 (INIS-SU—109, pp 291-295) **Isotopic dependence of cross sections for threshold reactions induced by 14 MeV neutrons.** Bychkov, V.M.; Pashchenko, A.B.; Plyaskin, V.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

A simple formulas produced which relate the (n,p) and (n,2n) cross sections to the (N-Z)/A parameter at fixed neutrons energy 14.5 MeV. It is shown that the isotopical dependence of cross sections is connected with the nucleon binding energy dependence on the (N-Z)/A parameter.

63754 (INIS-SU—109, pp 133-136) **Statistical description of kinetic energy distribution of fission fragments.** Adeev, G.D.; Filipenko, L.A. (Tomskij Politekhnicheskij Inst. (USSR). Inst. Yadernoj Fiziki, Ehlektroniki i Avtomatiki). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The question about configuration of fissioning nucleus at scission point is considered in the framework of statistical approach. The energy of Coulomb interaction of future fission fragments at scission point is calculated and the influence of variation of charge density in fission process on the kinetic energy of fission fragments is investigated.

63755 (INIS-SU—109, pp 129-132) **Influence of the model approximations on dynamic of the nuclear fission.** Cherdantsev, P.A. (Tomskij Politekhnicheskij Inst. (USSR). Inst. Yadernoj Fiziki, Ehlektroniki i Avtomatiki). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The influence of the different model functions of level density and transition probability as the function of the excitation energy was investigated. It was shown that thanks to the exponential dependence of level density on the excitation energy the dynamics of fission is almost model independent. It allows to use simple analytically solvable models.

63756 (INIS-SU—109, pp 99-103) **Influence of fragment kinetic energy distribution on differential fission prompt neutrons spectrum in laboratory system.** Akhmedov, G.M.; Stavinskij, V.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The influence of the fission fragment kinetic energy dispersion on the differential prompt fission neutron spectrum was analyzed. It is shown that the form of the spectrum depends essentially on the fragment kinetic energy distribution for the small angles relative to the direction of fission fragments.

63757 (INIS-SU—109, pp 68-72) **Preequilibrium fission fragment angular distribution.** Cherdantsev, P.A. (Tomskij Politekhnicheskij Inst. (USSR). Inst. Yadernoj Fiziki, Ehlektroniki i Avtomatiki). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

In accordance with the statistical theory an angular distribution of fission fragments defines by the equilibrium distribution of the projections of the angular momenta. Relaxation of the angular momenta is modelled and its influence on the angular distribution is investigated.

63758 (INIS-SU—109, pp 124-128) **Microscopic description of the delayed neutrons emission from fission products.** Aleksankin, V.G.; Lyutostanskij, Yu.S.; Sirotkin, V.K. (Moskovskij Inzhenerno-Fizicheskij Inst. (USSR)). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

Using the finite Fermy system theory the microscopic approach which enables to describe full probability and the emission spectrum of delayed neutrons (DN) of spherical nuclei- fission products has been developed. Full probabilities of the DN emission for 62 nuclei are calculated, 30 of them are predicted, the mean calculation error being 50%. On the example of ^{137}I the applicability of approach to the DN spectra description is analysed.

63759 (INIS-SU—109, pp 237-244) **Development of nuclear data evaluation methods for fissile nuclei.** Kon''shin, V.A. (AN Belorusskoj SSR, Minsk. Inst. Teplo- i Massoobmena). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

A brief review of the progress in developing the theoretical models for the nuclear data evaluation purposes of fissile nuclei is given at resonance energy. The Adler-Adler Reich-Moore and Breit-Wigner formalism has been employed.

63760 (INIS-SU—109, pp 286-290) **Calculation of neutron, proton and α-particles absorption cross sections by nuclei in the framework of optical model and analytical formulae.** Bychkov, V.M.; Karpov, V.V.; Pashchenko, A.V.; Plyaskin, V.I. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1980. (In Russian). Dep. NTIS (US Sales Only).

From 5. national Soviet conference on neutron physics; Kiev, Ukrainian SSR (15 Sep 1980).

The purpose of the present study js to choose optical set of parameters of optical potential on the basis of condition of the best description of experimental data available in energy and nuclei wide ranges, to calculate on the optical model basis (with optimal set of parameters) absorption cross sections and penetrability factors for protons and α particles, to obtain simple analytical expressions describing cross sections of chemical bond particles and nucleon nuclei absorption. A comparison of optical model calculations with experimental data has been done on nuclei in the region $10<=Z<=100$, and parameters are chosen which provide the best description of experimental results. A simple parametrization of results by analytical formulas depending only on Z and A of target nucleous is proposed.

63761 (KFK—3261) **Calculating matrix elements of Slater-determinant wave functions in the cluster model.** Beck, R. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.)). Dec 1981. 42p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE82750516.

This report is concerned with the calculation of matrix elements of Slater-determinant wave functions. These matrix elements are the basic input to any calculation with the Generator Coordinate Method (GCM). The main emphasis lies upon the projection of angular momentum and parity. The projection method is an analytical one making extensive use of Racah algebra and leads to closed expressions of these matrix elements in terms of 3-j, 6-j and 9-j symbols. It is shown that matrix elements of the kinetic energy operator may be obtained in a simple way from those of the normalization. The spurious contribution of the kinetic energy operator to the center-of-mass energy is eliminated by projecting the linear momentum of the states.

63762 **On the ENDF/B unresolved resonance region formalism representation.** de Saussure, G.; Barhen, J.; Munoz-Cobos, J.L.; Perez, R.B.; Wright, R.Q. (ORNL, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **39**: 883-885(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

6540 Radiation And Shielding Physics

REFER ALSO TO CITATION(S) 63214, 63269, 63349, 63350, 63396, 63400, 63627, 63687, 63769

63763 (FOA-C—20377-A2) **HINK: an interactive computer program giving data for the BAC radiation shielding program.** Pers, L.; Laurin, K.; Elvers, E. (Research Inst. of National Defence, Stockholm (Sweden)). Oct 1980. 59p. (Swedish). NTIS, PC A04/MF A01.

This computer program considers a building which is a right angle parallelepiped with rooms on several levels and openings in the outside and inside walls. This geometrical data, complemented by other physical data, compose the in-data for the BAC program which calculates shielding factors for initial radiation of buildings. Instructions for the use of HINK are given and how the data for houses should be handled and controlled is shown. The principle of interaction is explained with programming methods. (ESA)

63764 (INIS-mf—6819, pp 518) **Possibility of using Erenfest theorem in the problem of neutron bremssrahlung.** Plyujko, V.A.; Poyarkov, V.A. 1981. (In Russian). Dep. NTIS (US Sales Only).

From 31. conference on nuclear spectroscopy and nuclear structure; Samarkand, USSR (14 Apr 1981).

63765 (SAND—82-8022) **TARTNP user's manual for Sandia National Laboratories.** Miller, G.J. (Sandia National Labs., Livermore, CA (USA)). Aug 1982. Contract AC04-76DP00789. 42p. NTIS, PC A03/MF A01. Order Number DE82021100.

Portions of document are illegible.

This report gives the operating instructions and input definitions for the TARTNP Monte Carlo neutron/photon transport code. It also describes the limitations of the code and the pitfalls that may be encountered in using it.

6550 Medical Physics

63766 (FDA—81-8166, pp 527-540) **Dosimetric evaluation of brain scanning agents.** Eckerman, K.F.; Cristy, M.; Warner, G.G. (Oak Ridge National Lab., TN). Jun 1981. NTIS, PC A99/MF A01.

From ORAU radiopharmaceutical dosimetry symposium; Oak Ridge, TN, USA (6 Oct 1980).

Conventional radiopharmaceuticals used for scanning the brain are excluded from normal brain tissue by the presence of an intact blood-brain-barrier (BBB). The current generation of radiopharmaceuticals being developed is capable of crossing the intact BBB thus providing direct measurement of brain function. The dosimetry of the first generation agents is complicated by the presence of the BBB which prevents the agent from achieving uniform distribution as generally assumed in dosimetric evaluation. The second generation radiopharmaceuticals while crossing the BBB, are also nonuniformly distributed in the brain. Tabulations of specific absorbed fraction data for photon emitters uniformly distributed in the gray and in the white matter regions of the brain are presented and compared to values for a uniform distribution throughout the brain. Estimates of the specific absorbed fraction for the lens of the eye and the pituitary gland are also presented. The significance of the positron component to the dose to the regions of the brain is indicated for second generation scanning agents containing carbon-11, nitrogen-13, oxygen-15, and fluorine-18.

63767 (FDA—81-8166, pp 546-553) **Dose to the gall bladder from a /sup 99m/Tc labeled gall bladder scanning agent.** Bernard, S.R. (Oak Ridge National Lab., TN); Chen, S.M. Jun 1981. NTIS, PC A99/MF A01.

From ORAU radiopharmaceutical dosimetry symposium; Oak Ridge, TN, USA (6 Oct 1980).

A mathematical gall bladder was added to the mathematical phantom described in ORNL-5000 by W.S. Snyder et al. and the specific absorbed fractions (PHI) were calculated for the 22 target organs by the Monte Carlo code. From these data and the /sup 99m/Tc decay scheme data, the S factors (rads per μCi-day residence) for the organs when the source is in the gall bladder were estimated. From the reciprocity relationship for PHI, the S factors for the gall bladder when the source is located in any of the 22 source organs of the phantom were also estimated. The dose to the gall bladder wall from a single injection of the /sup 99m/Tc labeled scanning agent into man is estimated from the above to be ~ 0.52 rads/mCi plus or minus about 1/2 this value depending on the assumptions in the estimation of this value.

63768 (FDA—81-8166, pp 563-594) **S values for selected radionuclides and organs with the heart wall and heart contents as source organs.** Coffey, J.L.; Watson, E.E. (Oak Ridge Associated Universities, TN). Jun 1981. NTIS, PC A99/MF A01.

From ORAU radiopharmaceutical dosimetry symposium; Oak Ridge, TN, USA (6 Oct 1980).

The generalized heart model of MIRD Pamphlet No. 5, revised has no separation of heart wall from heart contents, and no specific absorbed fraction values were listed for heart as either a source or target organ. Because of this, the heart model of the heterogeneous phantom for dosimetry calculations was revised and a description of this model and specific absorbed fractions will be published in MIRD Pamplet No. 13. The purpose of this study is to use the specific absorbed fractions from MIRD-13 and decay scheme data to produce tables of S values (absorbed dose per unit cumulated activity) for selected radionuclides with the heart wall and heart contents as the source organs. As in the MIRD reports the activity is assumed to be uniformly distributed in the source organs. The PHI values for the photon energies of a given radionuclide were found by linearly interpolating between the energies listed in MIRD-13. When the source and target are the same, all nonpenetrating radiations are assumed to be absorbed in the organ in which they originate. For organs with walls and with the contents as the source, the dose to the wall from nonpenetrating radiations is assumed to be half of the dose to the contents.

6560 Solid State Physics

REFER ALSO TO CITATION(S) 63278, 63740

63769 (CONF-820929—6-Draft) **Neutron-scattering studies of the high-temperature spin dynamics of ferromagnetic materials.** Mook, H.A. (Oak Ridge National Lab., TN (USA)). Jul 1982. Contract W-7405-ENG-26. 15p. NTIS, PC A02/MF A01. Order Number DE82022297.

From IUPAP international conference on magnetism; Kyoto, Japan (6 Sep 1982).

The two approaches to understanding the magnetic properties of materials are the localized Heisenberg model and the band theory of electrons. Neutron scattering results at elevated temperatures will be discussed in terms of these models for EuO, Gd, and Ni. It is found that measurements near and above the Curie temperature T/sub c/ are particularly useful for distinguishing between models for ferromagnetism in these materials.

63770 (IPPCZ—239, pp 65-66) **About the cyclotron resonance of the skipping electrons in the infrared region of the frequency.** Preinhaelter, J.; Silin, V.P.; Tolkatchev, O.M. Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

63771 (LA-UR—82-2351) **Twist map, the extended Frenkel-Kontorova model and the devil's staircase.** Aubry, S. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 51p. (CONF-8205121—2). NTIS, PC A04/MF A01. Order Number DE82021778.

From CNLS order in Chaos conference; Los Alamos, NM, USA (24 May 1982).

Exact results obtained on the discrete Frenkel Kontorova (FK) model and its extensions during the past few years are reviewed. These models are associated with area preserving twist maps of the cylinder (or a part of it) onto itself. The theorems obtained for the FK model thus yields new theorems for the twist maps. The exact structure of the ground-states which are either commensurate or incommensurate and assert the existence of elementary discommensurations under certain necessary and sufficient conditions is described. Necessary conditions for the trajectories to represent metastable configurations, which can be chaotic, are given. The existence of a finite Peierl Nabarro barrier for elementary discommensurations is connected with a property of non-integrability of the twist map. The existence of KAM tori corresponds to undefectible incommensurate ground-states and a theorem is given which asserts that when the phenon spectrum of an incommensurate ground-state exhibits a finite gap, then the corresponding trajectory is dense on a Cantor set with zero measure length. These theorems, when applied to the initial FK model, allows one to prove the existence of the transition by breaking of analyticity for the incommensurate structures when the parameter which describes the discrepancy of the model to the integrable limit varies. Finally, we describe a theorem proving the existence of a devil's staircase for the variation curve of the atomic mean distance versus a chemical potential, for certain properties of the twist map which are generally satisfied.

63772 **Meaning of sink capture efficiency and sink strength for point defects.** Mansur, L.K. (Oak Ridge National Lab., TN (USA). Metals and Ceramics Div.); Brailsford, A.D. (Ford Motor Co., Dearborn, MI (USA)); Wolfer, W.G. (Wisconsin Univ., Madison (USA)). *Journal of Nuclear Materials;* **105**: No. 1, 36-38(Jan 1982).

The concepts of sink capture efficiency and sink strength for point defects are central to the theory of point defect reactions in materials undergoing irradiation. Two fundamentally different definitions of the capture efficiency are in current use. The essential difference can be stated simply. The conventional meaning denotes a measure of the loss rate of point defects to sinks per unit mean point defect concentration. A second definition of capture efficiency, introduced recently, gives a measure of the point defect loss rate without normalization to the mean point defect concentration. The relationship between the two capture efficiencies is here derived. By stating the relationship we hope to eliminate confusion

caused by comparisons of the two types of capture efficiencies at face value and to provide a method of obtaining one from the other. Internally consistent usage of either of the capture efficiencies leads to the same results for the calculation of measuable quantities, as is required physically.

63773 **Models for diffusion with trapping effects.** deAvillez, R.R.; Lauf, R.J.; Altstetter, C.J. (Univ. of Illinois at Urbana-Champaign). *Scripta Metallurgica;* **15**: 909-912(1981). Contract AC02-76ER01198.

Many models have been proposed to explain the effect of traps on interstitial diffusion. Some models are very general but either require extensive use of a computer or the expressions for the diffusion coefficient are too involved. These models, therefore can not be easily compared with experimental data. Simple models may have conceptual limitations, however, they can sometimes provide a consistent description of the experimental data within their validity. The models proposed by Oriani, by McLellan, and by Perkins and Padgett are discussed and compared using experimental data for oxygen diffusion in niobium-based alloys.

63774 **A note on the Stefan number in slab melting and solidification.** Solomon, A. (Oak Ridge National Lab., TN). *Letters in Heat and Mass Transfer;* **8**: 229-235(1981). Contract W-7405-ENG-26.

The Stefan number St is ordinarily described as the ratio of sensible to latent heat in a phase change process. We show that for a particular phase change process St does indeed approximate twice that ratio, and that the ratio is independent of time. The usefulness of the result for latent heat thermal energy storage analysis is noted via an example.

6561 Superconductivity

REFER ALSO TO CITATION(S) 63215, 63220, 63268

63775 **(IS-M—394) Theory of current-direction dependence of normal-zone propagation velocity in multifilamentary composite conductors - summary.** Clem, J.R. (Ames Lab., IA (USA); Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-82. 2p. (CONF-821108—1-Summ.). NTIS, PC A02/MF A01. Order Number DE82019304.

From Applied superconductivity conference; Knoxville, TN, USA (30 Nov 1982).

It has been known for some time that normal-zone propagation in a multifilamentary composite conductor is driven primarily by Joule heating in both the normal zone and the current-sharing zone, which lies between the normal (T > T/sub c/) and superconducting (I < I/sub c/) zones. Bartlett et al., however, discovered that the normal-zone propagation velocity along a multifilamentary Nb_3Sn/Cu composite conductor has different values depending upon the direction of current flow, the velocity difference being about 10%. Some thermoelectric effect is evidently responsible for such a current-direction dependence. Gurevich and Mints proposed an explanation in terms of the Thomson effect. In the present paper, however, we show that this effect is about an order of magnitude too small to account for the experimental results in the Nb_3Sn/Cu conductor. Instead we demonstrate that the experiments are well understood in terms of the Peltier effect, which is an important secondary source of heating or cooling, depending upon the current direction. Our theory is based upon that of Dresner but includes as heat sources, in addition to the Joule contribution, Thomson heat in the normal matrix and Peltier heat at the superconductor/normal matrix interfaces in the current-sharing zone.

6570 Theoretical Physics

63776 **(BONN-HE—81-24) Mean field methods for the description of N-fermion systems.** Dietz, K.; Lechtenfeld, O.; Weymans, G. (Bonn Univ. (Germany, F.R.). Physikalisches Inst.). Oct 1981. 23p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82750517.

Siegert's representation for the grand canonical partition function of a fermion system with two-particle interactions serves as a starting point for a perturbation expansion around stationary points. It is shown that, in general, the latter are given by solutions of the time-independent Hartree equation. Introducing more general random fields exchange terms are obtained in the stationarity equation. The procedure is extended to relativistic systems. A perturbative expansion for e.g. the ground state energy of the N-particle relativistic bound state problem is obtained which allows, contrary to Hamiltonian methods , a straightforward application of standard regularisation and renormalisation procedures.

63777 **(PP—700) Antiparticles from special relativity with orth-chronous and anti-chronous Lorentz transformations.** Recami, E.; Rodrigues, W.A. (Catania Univ. (Italy). Ist. di Fisica). Oct 1981. 17p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82905925.

Portions of document are illegible.

Special relativity can be based on the whole proper group of both ortho- and anti-chronous Lorentz transformations, and a clear physical meaning can be given also to antichronous (i.e., nonorthochronous) Lorentz transformations. From the active point of view, the latter require existence, for any particle, of its antiparticle within a purely relativistic, classical context. From the passive point of view, they give rise to frames "dual" of the ordinary ones, whose properties - here briefly discussed - are linked with the fact that in physics it is impossible to teach another, far observer (by transmitting only instructions, and no physical objects) our own conventions about the choices right/left, matter/antimatter, and positive/negative time direction. Interesting considerations follow, in particular, by considering - as it is the case - the CPT operation as an actual (even if antichronous) Lorentz transformation.

70 FUSION ENERGY

63778 **(IPP-Libr—67) Quarterly title list, July-September 1981.** (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)). 1981. 17p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82905944.

7001 Plasma Research

REFER ALSO TO CITATION(S) 63835

63779 **(CONF-820810—13) 3D nonlinear initial-value calculations in resistive MHD.** Holmes, J.A.; Hicks, H.R.; Carreras, B.A.; Garcia, L.; Lynch, V.E.; Masden, B.F. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 3p. NTIS, PC A02/MF A01. Order Number DE82022277.

From 10. international mathematics and computers simulation congress on systems simulation and scientific computation; Montreal, Canada (9 Aug 1982).

Portions of document are illegible.

An approach to the simulation of the resistive MHD equations in toroidal geometry is described. The equations are solved as an initial-value problem using a mixed finite-difference/spectral technique in a coordinate system based on the equilibrium magnetic field. A partially implicit first-order time-integration scheme is combined with modular programming techniques in order to minimize storage and computational work.

63780 **(CONF-820930—16) Curvature-driven instabilities in the Elmo Bumpy Torus (EBT).** Abe, H.; Spong, D.A.; Antonsen, T.M. Jr.; Tsang, K.T.; Nguyen, K.T. (Texas Univ., Austin (USA). Inst. for Fusion Studies; Oak Ridge National Lab., TN (USA); Maryland Univ., College Park (USA). Dept. of Physics and Astronomy; Science Applications, Inc., Boulder, CO (USA). Plasma Research Inst.; Michigan Univ., Ann Arbor (USA). Dept. of Nuclear Engineering). 1982. Contract W-7405-ENG-26. 17p. NTIS, PC A02/MF A01. Order Number DE82022334.

From 9. international conference on plasma physics and controlled nulcear fusion research; Baltimore, MD, USA (1 Sep 1982).

Portions of document are illegible.

Curvature-driven instabilities are analyzed for an EBT configuration which consists of plasma interacting with a hot electron

ring whose drift frequencies are larger than the growth rates predicted from conventional magnetohydrodynamic (MHD) theory. Stability criteria are obtained for five possible modes: the conventional hot electron interchange, a high-frequency hot electron interchange (at frequencies greater than the ion-cyclotron frequency), a compressional instability, a background plasma interchange, and an interacting pressure-driven interchange. A wide parameter regime for stable operation is found, which, however, severely deteriorates for a band of intermediate mode numbers. Finite Larmor radius effects can eliminate this deterioration; moreover, all short-wavelength curvature-driven modes are stabilized if the hot electron Larmor radius rho/sub h/ satisfies (κ/sub perpendicular/rho/sub h/)$^2 > 2\Delta/[R\beta$/sub h/$(1 + P'$/sub parallel//P'/sub perpendicular/)], where κ/sub perpendicular/ is the transverse wavenumber, Δ is the ring half-width, R is the mid-plane radius of curvature, β/sub h/ is the hot electron beta value, and P' is the pressure gradient. Resonant wave-particle instabilities predicted by a new low frequency variational principle show that a variety of remnant instabilities may still persist.

63781 (CONF-8109179—1) Aspects of stellarator confinement scaling. Hogan, J. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 28p. NTIS, PC A03/MF A01. Order Number DE82022273.

From 3. international stellarator workshop; Moscow, USSR (21 Sep 1981).

Portions of document are illegible.

Extensive discussion has been made concerning stellarator experimental confinement scaling and the extrapolation to reactor systems. Two features are discussed here: (1) The role of hydrogen-impurity interactions. (2) The neoclassical (bootstrap) current has been invoked as an argument against the possibility of optimizing the stellarator magnetic configuration to reach high β. It is felt that significant bootstrap current production under conditions of high β will dominate the vacuum fields. In this regard, a brief summary is presented of a comparison made between ISX-B high-β data and the neoclassical predictions. The non-neoclassical rates of electron pitch-angle scattering serve to destroy this current, and are evidently responsible for a lack of evidence for the bootstrap current under conditions in tokamaks where a large effect is expected.

63782 (DOE/ER/53104—2) Fusion plasma theory. Task I. Magnetic confinement fusion plasma theory. Annual progress report, January 1, 1982-December 31, 1982. Callen, J.D. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). Aug 1982. Contract AC02-80ER53104. 15p. NTIS, PC A02/MF A01. Order Number DE82020972.

The research on this contract over the past year has concentrated on some key tandem mirror confinement and heating issues (barrier trapping current, rf heating, low mode number stability) and on developing a comprehensive neoclassical transport theory for nonaxisymmetric toroidal plasmas (e.g., stellarators). Progress in these and some other miscellaneous areas are summarized briefly in this progress report.

63783 (DOE/ET/53088—45) Fluctuation spectra of a drift wave soliton gas. Meiss, J.D.; Horton, W. (Texas Univ., Austin (USA). Inst. for Fusion Studies). 1981. Contract FG05-80ET53088. 29p. (IFSR—45). NTIS, PC A03/MF A01. Order Number DE83000111.

A theory of drift wave turbulence is presented based on a low density gas of drift wave solitons. The Gibbs's ensemble for the ideal gas is used to calculate the dynamical scattering factor form $S(k,\omega)$. In contrast to renormalized turbulence theory, the spectrum has a broad frequency component with $\Delta\omega$ proportional to the fluctuation level δn/sub e//n_0 at fixed k and peaks at a frequency $\omega >$ k/sub y/v/sub de/.

63784 (DOE/ET/53088—60) Solitary drift waves in the presence of magnetic shear. Meiss, J.D.; Horton, W. (Texas Univ., Austin (USA). Inst. for Fusion Studies). Jul 1982. Contract FG05-80ET53088. 37p. (IFSR—60). NTIS, PC A03/MF A01. Order Number DE83000116.

The two-component fluid equations describing electron drift and ion acoustic waves in a nonuniform magnetized plasma are shown to possess nonlinear two-dimensional solitary wave solutions. In the presence of magnetic shear, radiative shear damping is exponentially small in L/sub s//L/sub n/ for solitary drift waves, in contrast to linear waves.

63785 (DOE/ET/53088—64) Large-scale particle simulations in a virtual-memory computer. Gray, P.C.; Wagner, J.S.; Tajima, T.; Million, R. (Texas Univ., Austin (USA). Inst. for Fusion Studies; Alaska Univ., Fairbanks (USA). Geophysical Inst.). Aug 1982. Contract FG05-80ET53088. 37p. (IFSR—64). NTIS, PC A03/MF A01. Order Number DE82021224.

Virtual memory computers are capable of executing large-scale particle simulations even when the memory requirements exceed the computer core size. The required address space is automatically mapped onto slow disc memory by the operating system. When the simulation size is very large, frequent random accesses to slow memory occur during the charge accumulation and particle pushing processes. Accesses to slow memory significantly reduce the execution rate of the simulation. We demonstrate in this paper that with the proper choice of sorting algorithm, a nominal amount of sorting to keep physically adjacent particles near particles with neighboring array indices can reduce random access to slow memory, increase the efficiency of the I/O system, and hence, reduce the required computing time.

63786 (DOE/ET/53088—65) Nonlinear electron Landau damping of ion-acoustic solitons. Meiss, J.D.; Morrison, P.J. (Texas Univ., Austin (USA). Inst. for Fusion Studies). Aug 1982. Contract FG05-80ET53088. 30p. NTIS, PC A03/MF A01. Order Number DE82021225.

The derivation begins with the coupled Vlasov-Poisson-ion fluid equations. Utilizing the standard ordering scheme of Gardner and Morikawa we obtain in Sec. II a reduced system: the coupled Vlasov-KdV equations. Instead of artificially separating resonant and nonresonant contributions, we use a subtraction procedure to isolate the nonadiabatic portion of the electron response. The Vlasov equation is solved by integrating along the electron orbits in a soliton with frozen amplitude.

63787 (IAE—3418/14) X-ray spectrometer on the base of CAMAC equipment. Andrushkevich, N.G.; Bryzgunov, V.A.; Vershkov, V.A.; Karzhavin, Yu.A.; Karzhavin, Yu.Yu.; Stepanenko, M.M. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Atomnoj Ehnergii). 1981. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE82702676.

X-ray spectrometer intended for investigating impurities in plasma of a thermonuclear tokamak type equipment is described. The spectrometer is meant for radiation detection of 1s-2p transition of a highly ionized chromium up to the hydrogen-like one. The spectrometer comprises a dispersant element for which the artificial quartz crystal of 20x50 mm dimension is used, position sensitive detector for which a proportional gas counter filled with the mixture 90% Xe+10% CH_4 and a complex of a detecting equipment controlled by a microprocessor. The detecting equipment is assembled on the CAMAC module base. The spectrometer is tested at the T- 10 equipment. It is stressed that the spectrometer described enables to automatize and considerably accelerate spectra obtaining and processing. The equipment assures spectra detection in 16 time windows in the course of one tokamak discharge in the 5.4-6 keV energy range with the 5 eV order resolution.

63788 (IPPCZ—239, pp 23-25) Deposition of energy of REBs with electron currents up to 100 kA in a magnetized plasma cluster. Sunka, P.; Clupek, M.; Jungwirth, K.; Kovac, I.; Piffl, V.; Ullschmied, J. Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

The transfer of energy of a relativistic electron beam into an inhomogeneous magnetized plasma is studied in the beam current and beam injection modes. Both propagating and oscillating beam modes can be implemented thanks to a special experimental arrangement. Beam-to-plasma energy transfer efficiency is evaluated from diamagnetic measurements. For a fix mode (propagating or oscillating beam) the total energy was deposited in plasma scales

proportionally to the beam current. The maximum heating efficiency (30%) and the maximum stored energy (2.5×10^{19} eVcm^{-1}) were found in the oscillating beam modes with the shortest plasma columns available. The waveforms of diamagnetic signals reflected a complex nature of the energy deposition and dissipation processes. The regular damped oscillations of the diamagnetic signals were shown to be magnetoacoustic oscillations of the whole plasma column. From their period and damping rate the local plasma density and temperature could be estimated.

63789 (IPPCZ—239, pp 27-42) **Apparatus for plasma electron temperature measurement by Thomson scattering.** Kolacek, K.; Babicky, V. Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

Equipment was developed and tested for measuring time-resolved local electron plasma temperature and density by the Thomson scattering of ruby laser light. The laser consists of a Q-switched generator (ruby 12 mm in diameter by 150 mm long) followed by one amplifier (ruby 16 mm indi long) followed by one amplifier (ruby 16 mm in diameter by 250 mm long). For Q-switching a Pockels cell with a z-cut ADP crystal was used. The laser is capable of delivering 4 J of energy in a pulse of 50 ns in duration. The spectrum of the laser light scattered at an angle of 9a degrees is analyzed by a six-channel polychromator. Fibre optics and photomultipliers with gated amplifiers are used. Output signals are transmitted via a parallel-to-series converter to a single-trace oscilloscope. The whole Thomson scattering apparatus was successfully tested by the Rayleigh scattering in the air at atmospheric pressure.

63790 (IPPCZ—239, pp 55-58) **Nonlinear generation of spatial harmonics at the edge of lower hybrid heated plasma.** Klima, R.; Pavlo, P.; Petrzilka, V.A. (Ceskoslovenska Akademie Ved, Prague. Ustav Fyziky Plazmatu); Pankratov, I.M. (AN Ukrainskoj SSR, Kharkov. Fiziko-Tekhnicheskij Inst.). Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

The existing theory of the interaction of a large-amplitude high-frequency wave with a low-temperature boundary layer of tokamak plasma is complemented by taking into account the z-dependence of the arising nonlinear density modulations (z-axis parallel to the steady-state magnetic field). It is shown that due to the action of ponderomotive forces of an hf field, spatial harmonics propagating into the plasma are generated. These spatial harmonics can be absorbed by the Landau damping more strongly than the original wave. In a two-dimensional model, nonlinear equations for the first and third Fourier components of the hf field amplitude are derived and solved numerically at second-order accuracy. Spatial dependences of the wave amplitudes are calculated.

63791 (IPPCZ—239, pp 59-60) **Fluid description of particle transport in hf heated magnetized plasma.** Klima, R. Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

63792 (IPPCZ—239, pp 60-61) **The effect of hf field on diffusion and convection in a plasma column.** Klima, R.; Petrzilka, V.A. Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

63793 (IPPCZ—239, pp 61-62) **Minimum hf power for steady state tokamak with wave-driven current.** Klima, R. Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

63794 (IPPCZ—239, pp 62-64) **The interaction of an electromagnetic wave with an inhomogeneous plasma - the numerical code.** Lacina, J.; Preinhaelter, J. Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

63795 (IPPCZ—239, pp 65) **On radiation forces in dissipative plasma.** Petrzilka, V.A. Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

63796 (IPPCZ—239, pp 79-80) **Excitation of a broad spectrum of waves in beam-plasma interaction.** Lacina, J. Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

63797 (IPPCZ—239, pp 80-82) **The use of computer symbolic algebra for analysis of non-linear wave-wave and wave-particle interaction in plasmas.** Sedlacek, Z. Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

63798 (IPPCZ—239, pp 82-83) **The dissipative instability of a relativistic electron beam.** Krocek, P. Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

63799 (IPPCZ—239, pp 83-84) **The dynamics of Langmuir soliton in the presence of ion-sound damping.** Krocek, P. Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

63800 (IPPCZ—239, pp 84-87) **Effect of trapped particles in the beat of two waves on the wave dynamics.** Krlin, L. Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

The interaction of two interfering monochromatic waves with particles having the velocity close to that of the wave beat is studied. The particles can be trapped in the effective beat potential trough. Expressions for the frequency of their oscillations and a canonically conjugated coordinate and momentum are derived. The backward effect of the trapped particles on the wave modulation is expressed in perturbation of the effective potential. The changed beat potential results in multiperiodicity of motion of particles, their phase bunching, and in instability in the second Mathieu region. The latter phenomenon suo-gests the possibility of energy transfer to particles via modulation of both waves at the second harmonic of the trapped-particle oscillations.

63801 (IPPCZ—239, pp 87-88) **On the acceleration of particles trapped in the effective potential trough of the beat of two waves.** Krlin, L. Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

63802 (IPPCZ—239, pp 66-69) **Reflex H.V. diodes and accumulation of OREB electrons in a magnetized plasma column.** Jungwirth, K. Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

63803 (IPPCZ—239, pp 70-74) **Computer simulation of electron or electron-ion reflex diodes and triodes coupled to an external electric circuit and ion beam generation.** Jungwirth, K.; Stavinoha, P. Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

63804 (IPPCZ—239, pp 75-78) **Similarity laws for quasistatic reflex E-beam systems coupled to an external electric circuit.** Jungwirth, K. Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

63805 (IPPJ—531) **Energy integral and variational principle for plasma kinetic modes.** Itoh, S.I.; Itoh, K.; Terashima, Y. (Nagoya Univ. (Japan)). Aug 1981. 15p. NTIS, PC A02/MF A01.

An energy principle is extended to include kinetic processes, finite gyroradius effects and wave-particle interactions, in electromagnetic instabilities in a toroidal plasma. The present arguments are based on the energy integrals which are derived from the eigenmode equations for electromagnetic perturbations. Inclusion of the finite gyroradius effects in the energy integral shows that this integral can be used for eigenmode by minimizing the excess energy of

the pertubed state. The extended stability conditions for kink-like mode and ballooning mode are obtained by use of this improved energy principle. For the case where wave-particle interaction is important, the energy integral becomes a rate equation of energy exchange, and a variational form can independently be constructed for the mode analysis.

63806 **(IPPJ—533) Oblique propagation of electron thermal modes below the electron plasma frequency without boundary effects.** Ohnuma, T.; Watanabe, T.; Sanuki, H. (Nagoya Univ. (Japan)). Aug 1981. 17p. NTIS, PC A02/MF A01.

The propagation characteristics and refractive effects of an oblique electron thermal mode without boundary effects below the electron plasma frequency were studied experimentally and theoretically in an inhomogeneous magnetized plasma. The behavior of this mode observed experimentally was confirmed by the theoretical analysis based on a type of ray theory.

63807 **(IPPJ-REV—1) Theory of drift instabilities and the associated anomalous transport.** Nishikawa, K.; Wakatani, M.; Tuda, T.; Tange, T.; Hatori, T.;. (Nagoya Univ. (Japan)). Jul 1981. 134p. NTIS, PC A07/MF A01.

Drift waves, which are inherent in inhomogeneous magnetized plasmas, are considered the most promising candidate for explaining anomalous particle and electron heat transport in toroidal plasmas. The linear and nonlinear theories of drift instability are examined. Anomalous transport in Tokamaks is examined from a phenomenological viewpoint as well as in to relation to kinetic theory. Saturation levels and modes are discussed as well as the effect of magnetic shear and of the torus.

63808 **(MPQ—53) Space-charge effects on ion pinhole images of laser-produced plasmas.** Izawa, Y. (Max-Planck-Institut fuer Quantenoptik, Garching (Germany, F.R.)). Oct 1981. 13p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE82905935.

Fast ion pinhole pictures of laser-produced plasmas were obtained on C-N film with a resolution close to the theoretical limit set by the camera geometry and pinhole diameter. This result was obtained in cases where the pinhole was at a sufficiently large distance from the laser-produced plasma ion source and the ion distribution was filtered by thin Al filters. When these precautions were not met the camera resolution was found to be degraded, possibly by space charge effects arising in the pinhole.

63809 **(NRL-MR—4882) Nonlinear aspects of the Rayleigh-Taylor instability in laser ablation.** Emery, M.H.; Gardner, J.H.; Boris, J.P. (Naval Research Lab., Washington, DC (USA)). 3 Sep 1982. Contract AI01-76ET53020. 22p. NTIS, PC A02/MF A01. Order Number DE82021075.

Portions of document are illegible.

We report on our investigation of the Rayleigh-Taylor (R-T) and Kelvin-Helmholtz (K-H) instabilities in laser ablatively accelerated targets for single mode perturbations for a series of wavelengths in the parameter regime $1/2 \leqq \lambda/\Delta R \leqq 10$, where λ is the wavelength of the perturbation and ΔR is the cold foil thickness. We find linear growth rates well below classical values (by a factor on the order of 3 to 4). We also find a cutoff in the growth rates for wavelengths less than the foil thickness. The striking result is the dominance of nonlinear effects; i.e., the K-H instability, for short wavelength perturbations. Although the linear growth rates increase as k/sup 1/2/ up to the cutoff, the K-H rollup dominates at large k, drastically reducing the penetration rate of the dense spike below its free fall value and effectively doubling the aspect ratio of the foil. In other words, it is the long wavelength perturbations that are most effective in destroying the symmetric implosion of the shell.

63810 **(PPPL—1917) Numerical studies of impurities in fusion plasmas.** Hulse, R.A. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Sep 1982. Contract AC02-76CH03073. 39p. NTIS, PC A03/MF A01. Order Number DE82022279.

The coupled partial differential equations used to describe the behavior of impurity ions in magnetically confined controlled fusion plasmas require numerical solution for cases of practical interest. Computer codes developed for impurity modeling at the Princeton Plasma Physics Laboratory are used as examples of the types of codes employed for this purpose. These codes solve for the impurity ionization state densities and associated radiation rates using atomic physics appropriate for these low-density, high-temperature plasmas. The simpler codes solve local equations in zero spatial dimensions while more complex cases require codes which explicitly include transport of the impurity ions simultaneously with the atomic processes of ionization and recombination. Typical applications are discussed and computational results are presented for selected cases of interest.

63811 **(PPPL—1920) Axisymmetric tokamak scapeoff transport.** Singer, C.E.; Langer, W.D. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Aug 1982. Contract AC02-76CH03073. 42p. NTIS, PC A03/MF A01. Order Number DE82022278.

We present the first self-consistent estimate of the magnitude of each term in a fluid treatment of plasma transport for a plasma lying in regions of open field lines in an axisymmetric tokamak. The fluid consists of a pure hydrogen plasma with sources which arise from its interaction with neutral hydrogen atoms. The analysis and results are limited to the high collisionality regime, which is optimal for a gaseous neutralizer divertor, or to a cold plasma mantle in a tokamak reactor. In this regime, both classical and neoclassical transport processes are important, and loss of particles and energy by diamagnetic flow are also significant. The prospect of extending the analysis to the lower collisionality regimes encountered in many existing experiments is discussed.

63812 **(PPPL—1933) Linear and nonlinear kinetic-stability studies in tokamaks.** Tang, W.M.; Chance, M.S.; Chen, L.; Krommes, J.A.; Lee, W.W.; Rewoldt, G. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Sep 1982. Contract AC02-76CH03073. 13p. NTIS, PC A02/MF A01. Order Number DE82022280.

This paper presents results of theoretical investigations on important linear kinetic properties of low frequency instabilities in toroidal systems and on nonlinear processes which could significantly influence their impact on anomalous transport. Analytical and numerical methods and also particle simulations have been employed to carry out these studies. In particular, the following subjects are considered: (1) linear stability analysis of kinetic instabilities for realistic tokamak equilibria and the application of such calculations to the PDX and PLT tokamak experiments including the influence of a hot beam-ion component; (2) determination of nonlinearly saturated, statistically steady states of three interacting drift modes; and (3) gyrokinetic particle simulation of drift instabilities.

63813 **MHD stability of vertically asymmetric tokamak equilibria.** Dalhed, H.E.; Grimm, R.C.; Johnson, J.L. (Princeton Univ., NJ (USA). Plasma Physics Lab.). *Nuclear Fusion;* **22**: No. 7, 883-892(Jul 1982).

The ideal-MHD stability properties of a special class of vertically asymmetric tokamak equilibria, with the plasma boundary a rotated ellipse, are examined. The calculations confirm that no major new physical effects are introduced and the modifications can be understood by conventional arguments. The results indicate that significant departures from up-down symmetry can be tolerated before the reduction in β becomes important for reactor operation. They show that the second stable region for internal modes can be extended to low-n modes and small-aspect-ratio devices by rotating the cross-section from a standing ellipse.

63814 **Contour analysis of fusion reactor plasma performance.** Houlberg, W.A.; Attenberger, S.E.; Hively, L.M. (Oak Ridge National Lab., TN (USA)). *Nuclear Fusion;* **22**: No. 7, 935-945(Jul 1982).

A method of analysing plasma performance over large regions of density and temperature space with time-dependent multidimensional transport codes is presented. Contour plots of global steady-state plasma parameters are generated and then used to show: the relationships between driven and ignited operation; regions of thermal stability; the effects of the shift of the magnetic

axis with increasing beta on beam penetration and thermal conduction losses from toroidal field ripple; and optimal neutral beam heating during start-up in tokamak reactor applications.

63815 **(UCRL-Trans—11759) Plasma-transport calculations in ambipolar trap by the direct Monte Carlo simulations.** Lysyansky, P.B.; Tiunov, M.A.; Pomel, B.M. (Lawrence Livermore National Lab., CA (USA)). Jan 1982. Contract W-7405-ENG-48. Translation of Russian Preprint 81-65. 23p. NTIS, PC A02/MF A01. Order Number DE82008162.

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The open magnetic trap plasma is simulated by the ensemble of test particles. A method of mapping was developed to calculate the drift motion in the real non-axisymmetric magnetic field. The collisions are simulated by random-changes of the test particles' velocities in accordance with their scattering on the background plasma. The radial and axial losses and neutral injection are taken into account. The values and characteristics of the axial and radial losses, the ions temperature and the radial profile of plasma density are the results of the calculations.

63816 **Numerical determination of axisymmetric toroidal magnetohydrodynamic equilibria.** Dalhed, H.E. (Princeton University, Princeton, N.J.); Greene, J.M. (Princeton University, Princeton, N.J.; South Australia, Flinders University, Bedford Park, Australia); Grimm, R.C. *Journal of Computational Physics;* **32**: 212-234(Aug 1979). Contract AC02-76CH03073.

Numerical schemes for the determination of stationary axisymmetric toroidal equilibria appropriate for modeling real experimental devices are given. Iterative schemes are used to solve the elliptic nonlinear partial differential equation for the poloidal flux function psi. The principal emphasis is on solving the free boundary (plasma-vacuum interface) equilibrium problem where external current-carrying toroidal coils support the plasma column but fixed boundary (e.g., conducting shell) cases are also included. The toroidal current distribution is given by specifying the pressure and either the poloidal current or the safety factor profiles as functions of psi. Examples of the application of the codes to tokamak design PPPL are given.

63817 **Overcoming fusion's challenge - What it is and how we're tackling it with magnetic confinement.** Kintner, E.E. (U.S. Department of Energy, Office of Fusion Energy, Washington, D.C.). *AIAA (American Institute of Aeronautics and Astronautics) Student Journal;* **17**: 20-22(Sum 1979).

An approach to solving the problem of heating and containing fusion fuel through magnetic confinement is presented. Two fundamentally different methods are examined: the first employs the tokamak concept, while the second employs the 'open' or 'mirror' confinement concept. The confinement and heating of the plasma using a neutron beam injection to ion temperature in excess of 70 million deg, led to three conclusions: (1) tokamak temperatures were increased threefold and brought within a factor of two to that of fusion temperature, (2) the confinement properties did not deteriorate with the increased temperature, and (3) the 'scaling laws', that determine the characteristics of power reactor plasma, were confirmed.

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REFER ALSO TO CITATION(S) 63228, 63230, 63231, 63232, 63233, 63234, 63241, 63242, 63261, 63628, 63809

63818 **(ANL/FPP/TM—161-Vol.1) Program plan for the DOE Office of Fusion Energy First Wall/Blanket/Shield Engineering Technology Program. Volume I. Summary, objectives and management. Revision 2.** (Argonne National Lab., IL (USA)). Aug 1982. Contract W-31-109-ENG-38. 82p. NTIS, PC A05/MF A01. Order Number DE83000862.

This document defines a plan for conducting selected aspects of the engineering testing required for magnetic fusion reactor FWBS components and systems. The ultimate product of this program is an established data base that contributes to a functional, reliable, maintainable, economically attractive, and environmentally acceptable commercial fusion reactor first wall, blanket, and shield system. This program plan updates the initial plan issued in November of 1980 by the DOE/Office of Fusion Energy (unnumbered report). The plan consists of two parts. Part I is a summary of activities, responsibilities and program management including reporting and interfaces with other programs. Part II is a compilation of the Detailed Technical Plans for Phase I (1982 to 1984) developed by the participants during Phase 0 of the program (July to December 1981).

63819 **(ANL/FPP/TM—161-Vol.2) Program plan for the DOE Office of Fusion Energy First Wall/Blanket/Shield Engineering Technology Program. Volume II. Detailed technical plan. Revision 2.** (Argonne National Lab., IL (USA)). Aug 1982. Contract W-31-109-ENG-38. 154p. NTIS, PC A08/MF A01. Order Number DE83000861.

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The four sections which comprise Part II describe in detail the technical basis for each of the four Program Elements (PE's) of the FWBS Engineering Technology Program (ETP). Each PE is planned to be executed in a number of phases. The purpose of the DTP's is to delineate detailed near-term research, development, and testing required to establish a FWBS engineering data base. Optimum testing strategies and construction of test facilities where needed are identified. The DTP's are based on guidelines given by Argonne National Laboratory which included the basic programmatic goals and the requirements for the types of tests and test conditions.

63820 **(BNL—31602) Some aspects of integral transport method for deep penetration problem.** Takahashi, H. (Brookhaven National Lab., Upton, NY (USA)). 1982. Contract AC02-76CH00016. 4p. (CONF-821103—15). NTIS, PC A02/MF A01. Order Number DE82019347.

From American Nuclear Society winter meeting; Washington, DC, USA (14 Nov 1982).

An analytical expression of the integral transport method for an experimental hole in fission reactors has been developed. This analytical method might still be useful for designing a fusion reactor without using large computer machine time.

63821 **(CONF-821103—18) 1-D hybrid code for FRM start-up.** Stark, R.A.; Miley, G.H. (Illinois Univ., Urbana (USA). Fusion Studies Lab.). 1982. Contract AC02-76ET52040. 5p. (COO—2218-248). NTIS, PC A02/MF A01. Order Number DE82020180.

From American Nuclear Society winter meeting; Washington, DC, USA (14 Nov 1982).

A one-D hybrid has been developed to study the start-up of the FRM via neutral-beam injection. The code uses a multi-group numerical model originally developed by J. Willenberg to describe fusion product dynamics in a solenoidal plasma. Earlier we described such a model for use in determining self-consistent ion currents and magnetic fields in FRM start-up. However, consideration of electron dynamics during start-up indicate that the electron current will oppose the injected ion current and may even foil the attempt to achieve reversal. For this reason, we have combined the multi-group ion (model) with a fluid treatment for electron dynamics to form the hybrid code FROST (Field Reversed One-dimensional STart-up). The details of this merger, along with sample results of operation of FROST, are given.

63822 **(DOE/ET/51013—54) Design practice and operational experience of highly irradiated, high-performance normal magnets.** Schultz, J.H. (Massachusetts Inst. of Tech., Cambridge (USA). Plasma Fusion Center). Sep 1982. Contract AC02-78ET51013. 66p. (PFC/RR—82-25). NTIS, PC A04/MF A01. Order Number DE83000541.

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The limitations of high performance magnets are discussed in terms of mechanical, temperature, and electrical limits. The limitations of magnets that are highly irradiated by neutrons, gamma radiation, or x radiation are discussed. (MOW)

63823 (IPPCZ—239, pp 14-15) **Regimes of ANDROMEDA system, controlled by an intelligent terminal and a central computer.** Koerbel, S. Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

63824 (IPPCZ—239, pp 15-17) **Erosion processes of oxidised and clean metal surfaces by unipolar arc in TM-1-MH tokamak.** Jakubka, K. (Ceskoslovenska Akademie Ved, Prague. Ustav Fyziky Plazmatu); Juettner, B. (Akademie der Wissenschaften der DDR, Berlin. Zentralinstitut fuer Elektronenphysik). Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

63825 (IPPCZ—239, pp 19-22) **Rebex 2 device.** Sunka, P.; Bohacek, V.; Kovac, I.; Lacina, J.; Piffl, V.; Ripa, M.; Rajsky, A.; Ullschmied, J. Jan 1981. Dep. NTIS (US Sales Only).

In Progress report 1979 - 1980.

The Rebex 2 device designed for experimental study of the interaction of high-current relativistic electron beams with plasma is described in detail. In the matched regime, the Rebex 2 accelerator produces electron beams with an energy of 450 keV and currents of 100kA, in a pulse of 100 ns in duration (FWHM). The six-stage Marx generator (maximum stored energy 13.5 kJ) serves primary energy storage. Three of its pressurized spark gaps are actively triggered. The high-voltage pulse is formed by a water-filled double-coaxial line with an impedance of 4.5 Ohm. The line is actively switched by a four-channel pressurized gas spark gap. The beam is generated in a vacuum high-voltage diode with a cold metallic cathode and an aluminum foil anode, and injected into an interaction chamber, fully or partially filled with a magnetized plasma. The plasma is produced by a plasma gun placed near the anode foil of the accelerator. The main specific feature of the Rebex device is the possibility of implementing both the oscillating and propagating beam modes.

63826 **(IPPJ—534) Boosting up of neutral beam heating power by slowly rising toroidal field.** Lin, R.Y.; Hirano, K. (Nagoya Univ. (Japan)). Aug 1981. 33p. NTIS, PC A03/MF A01.

A system of 1-D transport codes combined with Fokker-Planck codes was used to simulate plasmas undergoing compression with beam injection for the 'R-Project Tokamak'. The impurity radiation is not included. The numerical model contains the neoclassical transport including the Ware pinch, empirical anomalous particle and electron heat transports based on the Alcator scaling, and neutral particle transport. The combination results are very encouraging. They show that by sinusoidally increasing the toroidal magnetic field and the plasma current simultaneously, it is possible to significantly increase the temperature with a very slow compression. The final ion temperature is very weakly dependent on the compression time from 0.5 sec to 1 sec for the 'R-Project Tokamak'. If the 'R-Project Tokamak' plasma is compressed by sinusoidally increasing the magnetic field and plasma current simultaneously, then the beam power which is necessary to obtain an average ion temperature of keV without compression 15 MW can be decreased to 8.5 MW.

63827 **(LA-UR—82-2482) Alignment and focusing tolerance influences on optical performance.** Cross, E.W. (Los Alamos National Lab., NM (USA)). 1982. Contract W-7405-ENG-36. 7p. (CONF-820822—12). NTIS, PC A02/MF A01. Order Number DE82021766.

From 26. technical symposium and exhibition of the International Society for Optical Engineering; San Diego, CA, USA (21 Aug 1982).

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Alignment errors among components of an optical system may substantially degrade the image quality. Focus errors also affect system performance. The potential for serious degradation of image quality is substantial and requires that the tolerances for these errors receive significant attention early in system design. The image quality and reconnaissance performance of an all-reflecting Cassegrain is compared to an all-refractive optical system under conditions of zero and anticipated real world misalignments.

63828 **(MLM—2982-OP) Tritium storage/delivery and associated cleanup systems for TFTR.** Gill, J.T.; Anderson, B.E.; Watkins, R.A.; Pierce, C.W. (Mound Facility, Miamisburg, OH (USA); Princeton Univ., NJ (USA). Plasma Physics Lab.). 1982. Contract AC04-76DP00053. 27p. (CONF-821111—1). NTIS, PC A03/MF A01. Order Number DE82019274.

From 29. national symposium on American Vacuum Society; Baltimore, MD, USA (16 Nov 1982).

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The Tritium Storage and Delivery System (TSDS) will provide the tritium for high power plasmas in TFTR. TSDS will store tritium as solid uranium tritide at room temperature. At ≧ 400°C gas may be released from uranium and pumped through a metal bellows pump to a holding volume. Acceptably pure T_2 will be passed along a 40 m manifold into the storage volumes of three piezoelectric gas injection valves above the torus. Tests on several above components are described. Process components are contained within evacuable housings and three seismically qualified gloveboxes. Two of these boxes are serviced by catalytic oxidation/dessicant adsorption-based T_2 cleanup systems, one of which is dedicated and the other also detritiating torus and neutral beam exhaust gases. TSDS is located in a sealable vault, its air purifiable by a third such system. Emergency dehumidification of the torus test cell and its basement is also provided. TSDS and the cleanup systems will operate remotely under hardwired interlocks and operator-interactive computer control. Interlocks are safety-oriented and, e.g., prevent overheating of uranium, overpressurization of bellows pumps, and large glovebox pressure excursions. Tritium monitors are important to cleanup interlocks.

63829 **(NRL-MR—4860) Flash x radiography of laser-accelerated targets.** Whitlock, R.R.; Obenschain, S.P.; Grun, J. (Naval Research Lab., Washington, DC (USA)). 30 Aug 1982. Contract AI08-79DP40092. 8p. NTIS, PC A02/MF A01. Order Number DE82022213.

Flash x radiography of ablatively accelerated planar foils has provided quantitative measurements and qualitative observations regarding several parameters of critical interest to direct illumination laser fusion. A 1.05 micron, 3.3 nsec driver beam was focused onto carbon foils in a large (0.7-1 mm diameter) spot to reduce edge effects. From images produced by a backlighting x-ray flash, we have measured overall coupling efficiency, smoothing of laser nonuniformities, target velocity, and ablation pressure. The high velocity targets maintain a localized, high density (> 3% of solid). In contrast to other workers' recent measurement of pressure from x-ray imaging, our x-radiographic results, including pressure, are in general agreement with earlier NRL studies. Our results have also provided further insights into double foil interactions and planar target preheat measurements.

63830 **(NRL-MR—4916) Laser-ablative acceleration of targets to near inertial-fusion conditions.** Ripin, B.H.; Bodner, S.E.; Burkhalter, P.G. (Naval Research Lab., Washington, DC (USA)). 30 Aug 1982. Contract AI08-79DP40092. 17p. (CONF-820930—15). NTIS, PC A02/MF A01. Order Number DE82022075.

From 9. international conference on plasma physics and controlled nulcear fusion research; Baltimore, MD, USA (1 Sep 1982).

NRL is investigating the physics issues involved in the direct illumination approach to laser fusion. Millimeter diameter planar targets are ablatively accelerated to speeds and conditions near those required of fusion pellet shells using 3 to 5 ns, 1.05 μm light from the PHAROS II laser. At 5 x 10^{13} W/cm^2 targets were accelerated to 160 km/sec with a velocity uniformity of +- 7% through twenty times the initial target thickness and while remaining cool (< 10 eV). A joint NRL-LLNL experiment on SHIVA extended these results to beyond 10^{14} W/cm^2; the uniformity of acceleration of dense mm-diameter targets improved to better than +- 3.5% and the interaction physics remained benign. Also, absorption was above 65% and fast electrons were a minor energy channel. Thus, the moderate-irradiance direct-illumination approach appears to be an attractive option for laser fusion. To further verify this conjecture, particular attention is paid to the factors affecting the uniformity of acceleration or targets such as laser beam and target uniformity requirements, and various hydrodynamic mechanisms such as

Rayleigh-Taylor and Kelvin-Helmholtz instabilities. New diagnostic techniques are also discussed for measurements of plasma properties. These include: double-foil methods, x-ray backlighting, tracer-material techniques, Zeeman splitting measurements of magnetic fields, and others.

63831 (PPPL—1931) Observation of d(d,p)t reactions in the Princeton Large Torus. Chrien, R.E.; Strachan, J.D. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Sep 1982. Contract AC02-76CH03073. 13p. NTIS, PC A02/MF A01. Order Number DE82022225.

Protons from d(d,p)t fusion reactions have been observed in the Princeton Large Torus (PLT) using a surface-barrier detector. The time evolution of the escaping protons agrees with the d-d neutron evolution. The proton energy spectrum was measured during ohmic, lower-hybrid, and ICRF heating. The proton spectrum during lower-hybrid heating indicates non-thermal enhancement of the d-d fusion rate.

63832 (SAND—81-1229C) Response of materials to tokamak plasma disruptions. Whitley, J.B.; Mullendore, A.W.; Blewer, R.S.; Beezhold, W. (Sandia National Labs., Albuquerque, NM (USA)). 1981. Contract AC04-76DP00789. 6p. (CONF-811040—168). NTIS, PC A02/MF A01. Order Number DE82008466.

From 9. symposium on engineering problems of fusion research; Chicago, IL, USA (26 Oct 1981).

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The effect of disruptions or disruption type heat loads on materials have been studied using both tokamak exposures of primary limiters and tests in various laboratory systems. Disruptions are believed to be the primary cause of coating damage observed during tokamak exposure. A similar type of damage has been produced in the laboratory using a plasma channel system. An electron beam system has also been used to repeatedly pulse samples at high heat fluxes.

63833 (SAND—82-0123C) Thermal fatigue of a TiB_2-coated, long-pulse, high-heat-flux component. Whitley, J.B.; Mullendore, A.W.; Watson, R.D.; Smith, M.F.; Blewer, R.S. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 10p. (CONF-820545—8). NTIS, PC A02/MF A01. Order Number DE82014689.

From 5. international conference on plasma surface; Gatlinburg, TN, USA (3 May 1982).

A low Z plasma sprayed, refractory coating has been successfully applied to a water cooled copper target. The coating survived the severe thermal cycling without debonding. The copper substrate, though substantially cracked, also did not fail. These results suggest that it will be possible to engineer reliable low Z high heat flux components for use in long pulse fusion reactors.

63834 (SAND—82-1251C) Characteristics of light-ion-beam fusion systems. Mendel, C.W. Jr. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 19p. (CONF-820944—3). NTIS, PC A02/MF A01. Order Number DE82021080.

From Workshop on diagnostics for fusion reactor conditions; Varenna, Italy (6 Sep 1982).

The conditions for light ion beam fusion are extreme, involving large energies and short times, and the diagnostics needed for experiments are generally very different from those in other fusion fields. The only closely related field is that of laser fusion where the energies are smaller, but the times are even shorter. Typical particle beam fusion conditions require powers densities of the order of 10^{14} watts/cm^2 on targets of 5 to 10 mm diameter. The beam pulse should be about 10 ns long at the target. The first lecture will describe the state of present particle beam pulser technology, the diode concepts which are used in converting the electromagnetic pulse to particle beam energy, and the transport and focusing of the beam.

63835 (SAND—82-1253C) Diagnosing ion-beam targets, data acquisition, reactor conditions. Mendel, C.W. Jr. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 16p. (CONF-820944—6). NTIS, PC A02/MF A01. Order Number DE82021079.

From Workshop on diagnostics for fusion reactor conditions; Varenna, Italy (6 Sep 1982).

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The final lecture will discuss diagnostics of the target. These are very difficult because of the short times, small spatial extent, and extreme values of temperature and pressure. Diagnostics for temperature, density profile, and neutron production will be discussed. A few minutes will be devoted to data acquisition needs. The lecture will end with a discussion of current areas where improvements are needed and future diagnostics that will be required for reactor conditions.

63836 (UCRL—53307) Dynamic testing of MFTF containment-vessel structural system. Weaver, H.J.; McCallen, D.B.; Eli, M.W. (Lawrence Livermore National Lab., CA (USA)). 1 Apr 1982. Contract W-7405-ENG-48. 33p. NTIS, PC A03/MF A01. Order Number DE83000026.

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Dynamic (modal) testing was performed on the Magnetic Fusion Test Facility (MFTF) containment vessel. The seismic design of this vessel was heavily dependent upon the value of structural damping used in the analysis. Typically for welded steel vessels, a value of 2 to 3% of critical is used. However, due to the large mass of the vessel and magnet supported inside, we felt that the interaction between the structure and its foundation would be enhanced. This would result in a larger value of damping because vibrational energy in the structure would be transferred through the foundation into the surrounding soil. The dynamic test performed on this structure (with the magnet in place) confirmed this later theory and resulted in damping values of approximately 4 to 5% for the whole body modes. This report presents a brief description of dynamic testing emphasizing the specific test procedure used on the MFTF-A system. It also presents an interpretation of the damping mechanisms observed (material and geometric) based upon the spatial characteristics of the modal parameters (mode shapes).

63837 (UCRL—87499) Neutronic implications of lead-lithium blankets. Meier, W.R. (Lawrence Livermore National Lab., CA (USA)). Aug 1982. Contract W-7405-ENG-48. 15p. (CONF-820948—1). NTIS, PC A02/MF A01. Order Number DE82021629.

From 12. symposium on fusion technology; Juelich, F.R. Germany (13 Sep 1982).

Lead-lithium alloys have been proposed for use in several conceptual blanket designs for both inertial and magnetic confinement fusion reactors. In most cases, $Pb_{83}Li_{17}$, a eutectic with a melting point of 235°C, is the chosen composition. The primary reasons for using $Pb_{83}Li_{17}$ instead of Li as the tritium breeding material are the perceived safety advantages, low tritium solubility, and favorable neutronic characteristics. This paper describes the neutronic characteristics of $Pb_{83}Li_{17}$ blankets with emphasis on the enhanced neutron leakage through chamber ports and the degradation in blanket performance parameters that occurs as a result of the enhanced leakage.

63838 (UCRL—87528) Technology Development Facility (TDF). Doggett, J.N. (Lawrence Livermore National Lab., CA (USA)). 3 Sep 1982. Contract W-7405-ENG-48. 5p. (CONF-820948—3). NTIS, PC A02/MF A01. Order Number DE82022069.

From 12. symposium on fusion technology; Juelich, F.R. Germany (13 Sep 1982).

We have been studying small, driven, magnetic-mirror-based fusion reactors for the Technology Development Facility (TDF), that will test fusion reactor materials, components, and subsystems. Magnetic mirror systems are particularly interesting for this application because of their inherent steady-state operation, potentially high neutron wall loading, and relatively small size. Our design is a tandem mirror device first described by Fowler and Logan, based on the physics of the TMX experiments at Lawrence Livermore National Laboratory (LLNL). The device produces 20 MW of fusion power with a first-wall, uncollided 14-MeV neutron flux of 1.4 MW/m^2 on an area of approximately 8 m^2, while consuming approximately 250 MW of electrical power. The work was done by a combined industrial-laboratory-university group.

63839 **Optimization techniques for modular stellarator coils.** Chu, T.K.; Furth, H.P.; Johnson, J.L.; Ludescher, C.; Weimer, K.E. (Princeton Univ., NJ (USA). Plasma Physics Lab.). *Nuclear Fusion;* **22**: No. 7, 871-881(Jul 1982).

Introduction of a non-sinusoidal deformation can enhance the efficacy of modular coils for generating magnetic fields with a built-in rotational transform. Techniques are developed that provide an understanding of how specific deformations affect the harmonic content of the magnetic field and thus the properties of the vacuum configuration. A procedure is provided for optimizing a modular-coil configuration with respect to the equivalent current, which provides a useful measure of the product of the rotational transform and the cross-sectional area. Application is made to systems with l=2. It is shown that the configuration properties can be enhanced by introducing a modulation of the curve defining the centres of the coils or by having an additional elliptical shaping of the coils.

63840 **Reduced MHD equations for mirror machines.** Strauss, H.R. (New York Univ., NY (USA). Courant Inst. of Mathematical Sciences). *Nuclear Fusion;* **22**: No. 7, 893-902(Jul 1982).

Non-linear reduced tensor-pressure magnetohydrodynamic equations of motion are derived for β approximately 1 mirror machines, based on the 'long-thin' ordering. The equations may be solved numerically to obtain equilibria and ascertain stability. An application to 2XIIB is given.

63841 **Beta limits for ETF.** Helton, F.J.; Miller, R.L. (General Atomic Co., San Diego, CA (USA)). *Nuclear Fusion;* **22**: No. 7, 952-955(Jul 1982).

ETF (Engineering Test Facility) one-dimensional transport simulations indicate that a volume-average beta of 4% is required for ignition. It is therefore important that theoretical beta limits, determined by requiring equilibria to be stable to all ideal modes, exceed 4%. This paper documents an ideal MHD analysis wherein it is shown that, with appropriate plasma cross-sectional shape and current profile optimization, operation near 5% is possible. The critical beta value, however, depends on the functional form used for ff', which suggests that higher critical betas could be achieved by directly optimizing the safety factor profile.

63842 **Fusion reactor materials. Report on the Second American Nuclear Society Topical Meeting, Seattle, Washington, USA, 9-12 August 1981.** Ghoniem, N.M.; Conn, R.W. (California Univ., Los Angeles (USA). School of Engineering and Applied Science). *Nuclear Fusion;* **22**: No. 7, 977-984(Jul 1982).

This paper reports on the Second American Nuclear Society Topical Meeting on Fusion Reactor Materials, held in Seattle, Washington, from 9-12 August 1981. The objective of the conference was to review progress in materials research for fusion reactor applications during the past two years. Over 250 invited and contributed papers were presented. Progress in the following areas has been shown: (1) constraint in materials selection; (2) fundamental studies; (3) structural materials; (4) plasma/materials interactions; (5) compatibility between liquid metals and structures; (6) solid breeder materials; (7) special purpose materials and test methods.

63843 **MeV neutron streaming through cylindrical ducts on the TFTR.** Kolibal, J.; Ku, L.P. (PPPL, Princeton, NJ 08544). *Transactions of the American Nuclear Society;* **39**: 776-777(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63844 **Radiation shielding analysis of beam line penetrations in Hiball.** Sawan, M.E.; Sze, D.K.; Vogeisang, W.F. (Univ of Wisconsin, Madison, WI 53201). *Transactions of the American Nuclear Society;* **39**: 777-778(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63845 **Three-dimensional neutronics and photonics analysis for the Hiball reactor.** El-Guebaly, L.A.; Sawan, M.E.; Vogelsang, W.F. (Univ of Wisconsin, Madison, WI 53201). *Transactions of the American Nuclear Society;* **39**: 780-781(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63846 **INTOR radiation shielding system.** Abdou, M.A.; Gohar, Y. (ANL, Argonne, IL 60439). *Transactions of the American Nuclear Society;* **39**: 781-783(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63847 **Engineering consideration of the shielding design for the FMIT facility.** Bullock, T.P.; Burke, R.J.; Chang, J.K.; Huang, S.T.; Morford, R.J. (Ralph M. Parsons Co, Pasadena, CA 91124). *Transactions of the American Nuclear Society;* **39**: 783-784(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63848 **Nuclear heat deposition for a fusion-like neutron environment.** Carter, L.L.; Hegberg, D.E.H.; Wilcox, A.D. (Westinghouse Hanford, Richland, WA 99352). *Transactions of the American Nuclear Society;* **39**: 784-785(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

63849 **FMIT deuteron and neutron activation.** Carter, L.L.; Johnson, D.L.; Mann, F.M.; Morford, R.J.; Wilcox, A.D. (Westinghouse Hanford, Richland, WA 99352). *Transactions of the American Nuclear Society;* **39**: 774-775(1981). (CONF-811103—).

From ANS winter meeting; San Francisco, CA, USA (29 Nov 1981).

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63850 **(NP—82903837) GKSS 1980 annual report.** (GKSS-Forschungszentrum Geesthacht G.m.b.H., Hamburg (Germany, F.R.)). 1981. 151p. (In German). Dep. NTIS (US Sales Only), MF A01. Order Number DE82903837.

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The report contains 25 articles describing research and development activities at the Geesthacht GKSS Research Center. Research topics include steam-chugging in nuclear reactors, critical heat flux, boiling-reactor control elements, remote measurement of atmospheric gases by infrared lasers, and recovery of uranium from sea water. Tabulated information is also given on scientific institute activity and planned projects to be undertaken with outside research organizations. 69 references, 49 figures, 10 tables.

9901 Management

REFER ALSO TO CITATION(S) 63095, 63866

63851 **(UCRL—52000-82-9) Energy and Technology Review.** (Lawrence Livermore National Lab., CA (USA)). Sep 1982. Contract W-7405-ENG-48. 44p. NTIS, PC A03/MF A01. Order Number DE83000340.

Portions of document are illegible.

This is the first of two issues commemorating the 30th anniversary of the Lawrence Livermore National Laboratory. The early history of the laboratory is reviewed, including: the LLNL-Nevada organization; project Plowshare; the chemistry and materials science department; and development of computer systems. (GHT)

63852 (ZfI-Mitt—40, pp 59-69) **Structure and extent of data files for research management and planning.** Jankowski, L. May 1981. (In German). NTIS (US Sales Only), PC A07/MF A01.

From KDT meeting on information and application of computers in nuclear research; Roitzsch, German Democratic Republic (29 Oct 1980).

The paper is concerned with the structure and extent of the data files which are necessary for the efficient planning and management of a research institute. An analysis is made of the interrelations between decision-making and the amount of information, its content and structure, including consequences to be drawn for planning an in-house data bank for an institute. Special emphasis is placed on the type and structure of data files. The interrelations of the individual data with each other, the frequency of access and the necessity of involving individual agencies and services providing research guidance.

63853 **(ZfI-Mitt—40) Proceedings of the KDT meeting on information and application of computers in nuclear research.** (Akademie der Wissenschaften der DDR, Leipzig. Zentralinstitut fuer Isotopen- und Strahlenforschung). May 1981. 127p. (In German). (CONF-8010295—). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83780034.

From KDT meeting on information and application of computers in nuclear research; Roitzsch, German Democratic Republic (29 Oct 1980).

Separate abstracts were prepared for papers from this meeting. (KAW)

9902 Mathematics And Computers

REFER ALSO TO CITATION(S) 62694, 63763

63854 **(DOE/EIA/11873—T1) Requirements study concerning ADP and data communications for EIA. Report No. 1. Review of current ADP workload requirements. Final report.** (Analytic Systems, Inc., Vienna, VA (USA); CAP Gemini, Inc., Vienna, VA (USA)). 11 Sep 1981. Contract AC01-81EI11873. 81p. NTIS, PC A05/MF A01. Order Number DE82020472.

The general methodology used in preparing the report is described. Data sources as well as techniques used to reduce detailed data are described. The current ADP resources of EIA are documented. Current usage levels are then summarized and compared with government and industry standards for computer center operations. A comparison of the current workload with previously developed projections is documented. Projections and actuals are contrasted both for total workload and for specific ADP application projects. Finally, the detailed workload baseline which covers 110 specific projects is presented. The methodology for developing the baseline is also presented including methods for selecting projects for inclusion and capturing specific workload measures.

63855 **(ORNL/CSD—104) Solving the Plateau problem in parametric form.** Solomon, A.D.; Cahlon, B.; Nachman, L.J. (Oak Ridge National Lab., TN (USA)). Sep 1982. Contract W-7405-ENG-26. 27p. NTIS, PC A03/MF A01. Order Number DE83000220.

A method is presented for the numerical solution of the Plateau problem in parametric form. Specifically, a minimal surface spanning a simple closed curve in 3-dimensional space is sought. If the curve is planar then the problem reduces to that of finding a conformal mapping onto its interior.

63856 **(RISO-M—2326) Fault tree and cause consequence analysis for control software validation.** Taylor, J.R. (Risoe National Lab., Roskilde (Denmark)). Jan 1982. 21p. NTIS (US Sales Only), PC A02/MF A01; Also available from Risoe Library, DK-4000 Roskilde, Denmark. Order Number DE82702679.

A theory underlying application of automatic fault tree analysis to computer programs is described.

63857 **(SAND—82-0792) Matrix model of digital systems and its use in automatic test generation.** Acken, C. (Sandia National Labs., Albuquerque, NM (USA)). May 1982. Contract AC04-76DP00789. 90p. NTIS, PC A05/MF A01. Order Number DE82017640.

A mathematical model describing digital integrated circuits at the logic gate level is formulated. The model contains explicit information about the behavior of each logic gate in the circuit and about the entire circuit topology. The complexity of the model is shown to be linear in the number of lines in a gate level logic diagram of the circuit.

63858 **(SAND—82-0994) Two-chip implementation of the RSA public-key encryption algorithm.** Rieden, R.F.; Snyder, J.B.; Widman, R.J.; Barnard, W.J. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 14p. (CONF-821112—1). NTIS, PC A02/MF A01. Order Number DE82020623.

From Government microcircuit applications conference; Orlando, FL, USA (2 Nov 1982).

Portions of document are illegible.

A system has been developed which employs two identical integrated circuits to perform the encryption algorithm developed by Rivest, Shamir, and Adleman (RSA) on a 336-bit message. The integrated circuit used in the system employs the 3-micron polysilicon gate, radiation-hard, CMOS technology developed at Sandia National Laboratories.

63859 **(SAND—82-8001) Automatic addressing of telemetry channels.** Lucero, L.A. (Sandia National Labs., Livermore, CA (USA)). Aug 1982. Contract AC04-76DP00789. 34p. NTIS, PC A03/MF A01. Order Number DE82021101.

Portions of document are illegible.

To simplify telemetry software development, a design that eliminates the use of software instructions to address telemetry channels is being implemented in our telemetry systems. By using the direct memory access function of the RCA 1802 microprocessor, once initialized, addressing of telemetry channels is automatic, requiring no software. In this report the automatic addressing of telemetry channels (AATC) scheme is compared with an earlier technique that uses software. In comparison, the automatic addressing scheme effectively increases the software capability of the microprocessor, simplifies telemetry dataset encoding, eases dataset changes, and may decrease the electronic hardware count. The software addressing technique uses at least three instructions to address each channel. The automatic addressing technique requires no software instructions. Instead, addressing is performed using a direct memory access cycle stealing technique. Application of an early version of this addressing scheme to telemetry Type 1, Dataset 3, opened up the capability to execute 400 more microprocessor instructions than could be executed using the software addressing scheme. The present version of the automatic addressing scheme uses a section of PROM reserved for telemetry channel addresses. Encoding for a dataset is accomplished by programming the PROM with channel addresses in the order they are to be monitored. The telemetry Type 2 software was written using the software addressing scheme, then rewritten using the automatic addressing scheme. While 1000 bytes of memory were required by the software addressing scheme, the automatic addressing scheme required only 396 bytes. A number of prototypes using AATC have been built and tested in a full telemetry lab unit. All have worked successfully.

63860 **(STAN-CS—80-834) Numerical solution of the biharmonic equation.** Bjoerstad, P.E. (Stanford Univ., CA (USA). Dept. of Computer Science). Dec 1980. Contract AT03-76ER71030. 139p. NTIS, PC A07/MF A01. Order Number DE82016939.

Thesis.

The numerical solution of discrete approximations to the first biharmonic boundary value problem in rectangular domains is studied. Several finite difference schemes are compared and a family of new fast algorithms for the solution of the discrete systems is developed. These methods are optimal, having a theoretical computational complexity of $0(N^2)$ arithmetic operations and requiring $N^2+0(N)$ storage locations when solving the problem on an N by

N grid. Several practical computer implementations of the algorithm are discussed and compared. These implementations require $aN^2 + bN^2\log N$ arithmetic operations with $b << a$. The algorithms take full advantage of vector or parallel computers and can also be used to solve a sequence of problems efficiently. A new fast direct method for the biharmonic problem on a disk is also developed. It is shown how the new method of solution is related to the associated eigenvalue problem. The results of extensive numerical tests and comparisons are included throughout the dissertation. It is believed that the material presented provides a good foundation for practical computer implementations and that the numerical solution of the biharmonic equation in rectangular domains from now on, will be considered no more difficult than Poisson's equation.

63861 **(UCID—19498) Using mathematical models to augment the war gamers approach to analysis.** Diffley, M. (Lawrence Livermore National Lab., CA (USA)). 1 Jul 1981. Contract W-7405-ENG-48. 36p. NTIS, PC A03/MF A01. Order Number DE82020882.

Increasing emphasis is being placed on the use of interactive computer simulations ("war games") to assist in evaluating tactical weapon systems. One inherent weakness to this approach is that variance in simulation data often leads to inconclusive results. This paper suggests the use of mathematical models to augment simulation-based analyses. These models provide the analyst with a basis for comparing simulation results, processing and interpreting simulation data and conducting sensitivity studies. The mathematical basis for these models is developed in detail; use of a simple Lanchester-based model is illustrated; and the structure of a more complex model is outlined.

63862 **(UCID—19502) Preconditioning by incomplete block cyclic reduction.** Rodrigue, G.; Wolitzer, D. (Lawrence Livermore National Lab., CA (USA)). 1 Sep 1982. Contract W-7405-ENG-48. 41p. NTIS, PC A03/MF A01. Order Number DE82021946.

Iterative methods for solving linear systems arising from the discretization of elliptic/parabolic partial differential equations require the use of pre-conditioners to gain increased rates of convergence. Preconditioners arising from incomplete factorizations have been shown to be very effective. However, the recursiveness of these methods can offset these gains somewhat on a parallel processor. In this paper, an incomplete factorization based on block cyclic reduction is developed. It is shown that under block diagonal dominance conditions the off-diagonal terms decay quadratically, yielding more effective algorithms.

63863 **Space modification: an alternative approach to chemistry problems involving geometry.** Silver, G.L. (Mound Facility, Miamisburg, OH). *Journal of Computational Chemistry;* **2**: No. 4, 478-482(1981). Contract AC04-76DP00053.

The sequential simplex optimization algorithm has been translated into non-Euclidean space. A study of the algorithm in this space suggests that the path of convergence of the simplex depends on the properties of the space so that different convergence paths can be obtained even with the same starting points. The path of convergence approaches the path observed in Euclidean space as the metric constant of the hyperbolic space increases.

9903 Information Handling

REFER ALSO TO CITATION(S) 63852, 63853

63864 **(CONF-810842—8) Discussion at the 1981 annual meeting of the American Statistical Association.** Wright, T. (Union Carbide Corp., Oak Ridge, TN (USA). Nuclear Div.). 1981. Contract W-7405-ENG-26. 5p. NTIS, PC A02/MF A01. Order Number DE82020904.

From American Statistical Association meeting; Detroit, MI, USA (10 Aug 1981).

Summary comments are made on the papers given on energy data validation. (GHT)

63865 **(DOE/TIC—4581-R5) Energy Data Base: output magnetic tape description.** Busse, A.E. (ed.). (Department of Energy, Oak Ridge, TN (USA). Technical Information Center). Jun 1982. 20p. NTIS, PC A02/MF A01. Order Number DE82014313.

This document describes a format for disseminating bibliographic citations, abstracts and subject content indicators for energy information on computer readable magnetic tape issued after July 1976. The magnetic tapes contain information incorporated into the DOE data base. This base is used by TIC to generate multiple publications and to support information retrieval activities. Information, or data, pertinent to one bibliographic reference will be called an entry. The entries are logically composed of data elements (such as title, authors, etc.). This format supersedes a previous version, used since 1974, as described in Report TID-4581-R4. The format has been revised to permit incorporation of DOE/TIC bibliographic data encompassing the broader scope of information related to the development or use of energy resources.

63866 (ZfI-Mitt—40, pp 91-101) **Structure, organization and usage of the data bank OEKFAK.** Pfund, A.; Toepfer, S. May 1981. (In German). NTIS (US Sales Only), PC A07/MF A01.

From KDT meeting on information and application of computers in nuclear research; Roitzsch, German Democratic Republic (29 Oct 1980).

An introduction is given into the structure and the usage of a data bank for nuclear research and technology, which is established in the ZfI Leipzig. Collection, analysis, and storage of information (facts) is described.

CORPORATE AUTHOR INDEX

In the Corporate Index, report literature is indexed using the name of the organization or institution responsible for issuing the report. Headings are provided for all report literature and for published literature for which a corporate approach is especially desirable, e.g., symposium and conference proceedings.

Each entry under a corporate heading gives the report title and the volume and abstract numbers. Report numbers, if applicable, are given in parentheses at the end of the entry.

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Qualifier
Title, (supplementary information), citation number, (report number)

The title may be supplemented with additional words, or a phrase, if it appears additional information would be helpful. In cases for which the title contains little or no information related to the subject entry, it may be replaced entirely by the supplementary information. A qualifier is not always required, and in such cases the title will follow the unqualified subject descriptor.

The descriptors selected for use as subject terms are generally the names of specific materials, things, or processes. To the extent possible, a qualifier is selected to describe the properties of, or processses applied to, the subject term.

Index entries are selected to indicate the important ideas and concepts presented in a document, rather than words that may appear in the text. Within the available thesaurus terms, the most probable or logical place to look for typical information is selected. "See references" are included to guide users from synonymous terms or phrases to the descriptor selected as a subject heading for the concept. (e.g. Pipeline Quality Gas see HIGH BTU GAS). "See also references" are used to indicate where to find references to subject concepts that are narrower, broader, or related to a particular subject heading. To complete an exhaustive search of a given subject, all such headings should be reviewed.

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CONF-8111107-	(Final design review meeting on EC photovoltaic pilot projects, Brussels, Belgium, 30 Nov-2 Dec 1981)			
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CONF-8111108-	(European hybrid spectrometer workshop on holography and high-resolution techniques, Strasbourg, France, 9-12 Nov 1981)			
Pt.1	*See* CERN-82-01	DE82780804	MN -34D	7:63645
CONF-8111117-	(6. convention of the technological section - individual gas heating: means for saving energy, Rome, Italy, 5-6 Nov 1981)			
1-Trans.	NTIS (US Sales Only), MF A0102/MF A01	DE82906407	MN -90c	7:63128
CONF-820250-	(3. annual contractors' meeting on health and environmental risk and analysis program, Alexandria, VA, USA, 16-18 Feb 1982)			
Summ.	NTIS, PC A13/MF A01	DE82018085	MN -11	7:63529
CONF-820260-	(Atomic Industrial Forum workshop on nuclear power financing, Las Vegas, NV, USA, 7-10 Feb 1982)			
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CONF-820420-	(International ENS/ANS conference on nuclear energy with emphasis on fuel cycles, Brussels, Belgium, 26-30 Apr 1982)			
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CONF-820422-	(American Society of Civil Engineers conference, Las Vegas, NV, USA, 26-30 Apr 1982)			
1	*See* SAND-82-0621C	DE82008191	MN -70	7:62783
CONF-820474-	(12. annual symposium on the analytical chemistry of pollutants, Amsterdam, Netherlands, 14-16 Apr 1982)			
1	*See* BNL-31596	DE82019543	MN -11	7:63473
CONF-820506-	(International conference on geothermal energy, Florence, Italy, 11-14 May 1982)			
6	*See* BNL-31737	DE82021561	MN -66d	7:62937
CONF-820545-	(5. international conference on plasma surface, Gatlinburg, TN, USA, 3-5 May 1982)			
8	*See* SAND-82-0123C	DE82014689	MN -20a	7:63833
CONF-8205121-	(CNLS order in Chaos conference, Los Alamos, NM, USA, 24-28 May 1982)			
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CONF-820628-	(11. international symposium on effects of radiation on materials, American Society for Testing and Materials, Scottsdale, AZ, USA, 28-30 Jun 1982)			
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CONF-820635-	(International conference on hypernuclear and kaon physics, Heidelberg, F.R. Germany, 20-24 Jun 1982)			
7	*See* BNL-31671	DE82021758	MN -34D	7:63636
CONF-820676-	(SERI biomass program principal investigators review meeting, Washington, DC, USA, 23-25 Jun 1982)			
3	*See* SERI/TP-234-1650	DE82019101	MN -61a	7:62843
CONF-8206101-	(Conference on pulsations in classical and cataclysmic variable stars, Boulder, CO, USA, 1 Jun 1982)			
6	*See* LA-UR-82-2349	DE82021777	MN -34B	7:63577
7	*See* LA-UR-82-2346	DE82021774	MN -34B	7:63616
9	*See* LA-UR-82-2333	DE82021770	MN -34B	7:63576
CONF-8206116-	(Workshop on division of particles and fields of the APS, Aspen, CO, USA, 28 Jun-16 Jul 1982)			
1	*See* BNL-31783	DE83000266	MN -34D	7:63632
CONF-8206118-	(6. annual international collaboration of advanced neutron sources meeting, Argonne, IL, USA, 28 Jun-2 Jul 1982)			
2	*See* LA-UR-82-2481	DE82021900	MN -34C	7:63400
CONF-820746-	(Enrico Fermi International School of Physics on nuclear structure and heavy ion dynamics, Varenna, Italy, 27 Jul-6 Aug 1982)			
1	*See* LBL-14563	DE82020337	MN -34C	7:63713
CONF-820802-	(International meeting on thermal nuclear reactor safety, Chicago, IL, USA, 29 Aug-2 Sep 1982)			
22	NTIS, PC A02/MF A01	DE82020932	MN -78	7:63059
23-Draft	NTIS, PC A02/MF A01	DE82022336	MN -80	7:63041
24	*See* SAND-82-1697C	DE82020986	MN -78	7:63073
25	*See* SAND-82-0403C	DE82020974	MN -78	7:63069
26	*See* SAND-82-1930C	DE82020987	MN -78	7:63074
CONF-820810-	(10. international mathematics and computers simulation congress on systems simulation and scientific computation, Montreal, Canada, 9-13 Aug 1982)			
13	NTIS, PC A02/MF A01	DE82022277	MN -20g	7:63779
CONF-820822-	(26. technical symposium and exhibition of the International Society for Optical Engineering, San Diego, CA, USA, 21-27 Aug 1982)			
12	*See* LA-UR-82-2482	DE82021766	MN -21	7:63827
CONF-820827-	(Energy storage contractors review meeting, Arlington, VA, USA, 23-26 Aug 1982)			
2	*See* SERI/TP-231-1660	DE82018306	MN -94a	7:62922
20	*See* BNL-31668	DE82021569	MN -94d	7:62801
23	*See* SERI/TP-252-1684	DE82020852	MN -62	7:62893
CONF-820833-	(17. DOE nuclear air cleaning conference, Denver, CO, USA, 1 Aug-6 Sep 1982)			
10-Draft	NTIS, PC A03/MF A01	DE82020834	MN -90i	7:62751
13	NTIS, PC A02/MF A01	DE82020930	MN -70	7:62752
CONF-820839-	(International conference on X-ray and VUV synchrotron radiation instrumentation, Hamburg, F.R. Germany, 9-13 Aug 1982)			
2	*See* BNL-31855	DE83000264	MN -28	7:62800
CONF-820843-	(US-Japan seminar on new models and constitutive relations in the mechanics of granular materials, Ithaca, NY, USA, 22-27 Aug 1982)			
2	*See* SAND-82-1977C	DE82020408	MN -38	7:63358
CONF-820849-	(Summer study in energy efficient buildings, Santa Cruz, CA, USA, 22-28 Aug 1982)			
6	*See* SERI/TP-254-1682	DE82022076	MN -59c	7:62909
8	*See* LBL-14788	DE82021789	MN -95d	7:63164
CONF-820855-	(International conference on X-ray and atomic inner-shell physics, Eugene, OR, USA, 23-27 Aug 1982)			
2	*See* DOE/ER/01198-1388	DE82021591	MN -34A	7:63618
3	NTIS, PC A02/MF A01	DE82020891	MN -34A	7:63617
CONF-820869-	(5. European conference on surface science, Gent, Belgium, 24-27 Aug 1982)			
1-Draft	NTIS, PC A02/MF A01	DE82020892	MN -34A	7:63278
CONF-820870-	(Nordic conference on surface science, Tampere, Finland, 18-20 Aug 1982)			
1-Draft	NTIS, PC A02/MF A01	DE82020829	MN -34A	7:63279
CONF-820871-	(11. international colloquium on group theoretical methods in physics, Istanbul, Turkey, 23-28 Aug 1982)			
1	*See* BNL-31823	DE82022046	MN -34D	7:63637
CONF-820906-	(16. IEEE photovoltaics specialists conference, San Diego, CA, USA, 28-30 Sep 1982)			
3	NTIS, PC A02/MF A01	DE82022337	MN -34	7:62824
CONF-820907-	(13. international power sources symposium, Brighton, UK, 27-30 Sep 1982)			
3	*See* SAND-82-2055C	DE82020963	MN -94cc	7:63094
CONF-820914-	(International conference on nuclear power experience, Vienna, Austria, 13-17 Sep 1982)			
3	*See* IAEA-CN-42/277	DE82021182	MN -79e	7:63011
CONF-820915-	(BNES international conference on gas cooled reactors today, Bristol, UK, 20-24 Sep 1982)			
4	NTIS MF A01	DE82022262	MN -77	7:63004
CONF-820929-	(IUPAP international conference on magnetism, Kyoto, Japan, 6-10 Sep 1982)			
5-Draft	NTIS, PC A02/MF A01	DE82022299	MN -34	7:63269

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6-Draft	NTIS, PC A02/MF A01	DE82022297	MN -34C	7:63769
CONF-820930-	(9. international conference on plasma physics and controlled nulcear fusion research, Baltimore, MD, USA, 1-8 Sep 1982)			
15	*See* NRL-MR-4916	DE82022075	STD -21	7:63830
16	NTIS, PC A02/MF A01	DE82022334	MN -20g	7:63780
CONF-820935-	(6. Yamada conference on neutron scattering of condensed matter, Tokyo, Japan, 1 Sep 1982)			
4-Draft	NTIS, PC A02/MF A01	DE82022263	MN -34	7:63215
5	*See* BNL-31798	DE83000265	MN -34A	7:63214
CONF-820941-	(5. international symposium on high energy spin physics, Brookhaven, NY, USA, 16-22 Sep 1982)			
2	*See* LA-UR-82-2622	DE83000332	MN -34D	7:63655
CONF-820942-	(Nuclear data for science and technology international conference, Antwerp, Belgium, 6-10 Sep 1982)			
5	*See* UCRL-87287	DE82020865	MN -34	7:63725
CONF-820943-	(ANS topical meeting - spent fuel storage, Savannah, GA, USA, 26-29 Sep 1982)			
2	NTIS, PC A02/MF A01	DE82022269	MN -79c	7:63008
CONF-820944-	(Workshop on diagnostics for fusion reactor conditions, Varenna, Italy, 6-17 Sep 1982)			
3	*See* SAND-82-1251C	DE82021080	MN -21	7:63834
6	*See* SAND-82-1253C	DE82021079	MN -21	7:63835
CONF-820945-	(International conference on ion beam modification of materials, Grenoble, France, 6-10 Sep 1982)			
2	*See* SAND-82-0778C	DE82021725	MN -70	7:62784
CONF-820947-	(4. international symposium on gas flow and chemical lasers, Stresa, Italy, 13-17 Sep 1982)			
1	*See* LA-UR-82-2424	DE82021885	MN -22	7:63354
2	*See* LA-UR-82-2425	DE82021889	MN -22	7:63355
CONF-820948-	(12. symposium on fusion technology, Juelich, F.R. Germany, 13-17 Sep 1982)			
1	*See* UCRL-87499	DE82021629	MN -21	7:63837
3	*See* UCRL-87528	DE82022069	MN -20	7:63838
CONF-820949-	(1. international congress on applications of lasers and electro-optics, Boston, MA, USA, 21-23 Sep 1982)			
1	*See* LA-UR-82-2430	DE82021892	MN -22	7:63317
2	*See* LA-UR-82-2452	DE82021893	MN -22	7:63318
CONF-820951-	(NRC surveillance and diagnostics review group meeting, Rockville, MD, USA, 20-21 Sep 1981)			
1	NTIS, PC A02/MF A01	DE82022265	MN -78	7:63001
CONF-820952-	(International symposium on helium in metals, Juelich, F.R. Germany, 21-24 Sep 1982)			
1-Draft	NTIS, PC A02/MF A01	DE82022266	MN -34	7:63216
CONF-820953-	(7. international symposium on pteridines and folic acid derivatives, St. Andrews, UK, 1 Sep 1982)			
1	NTIS, PC A02/MF A01	DE82022344	MN -48	7:63535
CONF-820954-	(5. Madison waste research conference, Madison, WI, USA, 30 Sep 1982)			
1	NTIS, PC A02/MF A01	DE82022264	MN -11	7:63545
CONF-820958-	(4. symposium on nulcear chemistry, radiochemistry and radiation chemistry, Mexico City, Mexico, 7-10 Sep 1982)			
1	*See* LA-UR-82-2590	DE83000330	MN -10	7:63289
CONF-821005-	(DOE international decommissioning symposium, Seattle, WA, USA, 10-14 Oct 1982)			
9	*See* LA-UR-82-2323	DE82021768	MN -70	7:62772
CONF-821008-	(IEEE annual meeting of the Industry Applications Society, San Francisco, CA, USA, 4-7 Oct 1982)			
2	*See* LBL-14651	DE82018778	MN -95f	7:63163
CONF-821024-	(10. international symposium on discharges and electrical insulation in vacuum, Columbia, SC, USA, 25-28 Oct 1982)			
5	*See* SAND-82-1188C	DE82021251	MN -25	7:63224
CONF-821029-	(IEEE Computer Society international symposium on medical imaging and image interpretation, Berlin, F.R. Germany, 26-28 Oct 1982)			
1	*See* LA-UR-82-2417	DE82021884	MN -32	7:63359
2	*See* UCRL-88102	DE82020955	MN -48	7:63543
CONF-821030-	(19. joint Army/Navy/NASA/Air Force combustion meeting, Greenbelt, MD, USA, 4-7 Oct 1982)			
1-Rev.1	*See* UCRL-87451-Rev.1	DE82021928	MN -13	7:63469
CONF-821101-	(ASME winter annual meeting, Pheonix, AZ, USA, 14-19 Nov 1982)			
1	*See* K/CSD/INF-82/6	DE82012817	MN -59c	7:63160
1-Rev.1	*See* K/CSD/INF-82/6-R1	DE82018350	MN -59c	7:63161
5	*See* DP-MS-82-13	DE82016267	MN -80	7:63054
10	*See* SERI/TP-253-1667	DE82020923	MN -59c	7:62915
CONF-821102-	(6. international conference on powder metallurgy, Brno, Czechoslovakia, 10-12 Nov 1982)			
1	*See* LA-UR-82-1140	DE82014051	MN -25	7:63265
CONF-821103-	(American Nuclear Society winter meeting, Washington, DC, USA, 14-19 Nov 1982)			
1	*See* LBL-14247	DE82014473	MN -80	7:63064
5	*See* SAND-82-1595C	DE82018745	MN -78	7:63072
6	*See* SAND-82-1519C	DE82018746	MN -80	7:63071
7	*See* SAND-82-1588C	DE82018646	MN -15	7:62796
9	*See* MLM-2961-OP	DE82019174	MN -16	7:63290

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15	*See* BNL-31602	DE82019347	MN -20	7:63820
18	NTIS, PC A02/MF A01	DE82020180	MN -20a	7:63821
22	*See* BNL-NUREG-31678		MN -80	7:63058
CONF-821104-	(2. international conference on nuclear technology transfer, Buenos Aires, Argentina, 1-5 Nov 1982)			
1	*See* SAND-82-0882C	DE82014504	MN -78	7:63070
CONF-821105-	(Asilomar conference, Pacific Grove, CA, USA, 8-10 Nov 1982)			
2	*See* SAND-82-1353C	DE82020090	MN -32	7:63363
CONF-821106-	(Annual meeting of heat transfer and energy conversion, Los Angeles, CA, USA, 14-18 Nov 1982)			
1	*See* LA-UR-82-1483	DE82015803	MN -78	7:63063
2	*See* SAND-82-1355C	DE82018648	MN -4	7:63630
3	*See* DOE/ER/10720-4	DE82019549	MN -90d	7:62806
5	NTIS, PC A03/MF A01	DE82020859	MN -90a	7:62674
7-Draft	NTIS, PC A02/MF A01	DE82021189	MN -92a	7:62805
CONF-821107-	(6. international symposium on the scientific basis for radioactive waste management, Boston, MA, USA, 1-4 Nov 1982)			
1	*See* BNL-NUREG-31391		MN -70	7:62750
3	*See* SAND-82-1375C	DE82020964	MN -70	7:62785
CONF-821108-	(Applied superconductivity conference, Knoxville, TN, USA, 30 Nov-3 Dec 1982)			
1-Summ.	*See* IS-M-394	DE82019304	MN -34	7:63775
CONF-821109-	(International conference on recent developments in specialty steels and hard materials, Pretoria, South Africa, 8-12 Nov 1982)			
1	*See* SAND-82-1152C	DE82018300	MN -90d	7:63260
CONF-821110-	(3. annual national low-level waste management program meeting, New Orleans, LA, USA, 4-6 Nov 1982)			
1	*See* BNL-31591	DE82018065	MN -70	7:62749
CONF-821111-	(29. national symposium on American Vacuum Society, Baltimore, MD, USA, 16-19 Nov 1982)			
1	*See* MLM-2982-OP	DE82019274	MN -20	7:63828
3	*See* MLM-2990-OP	DE82021346	MN -4	7:63308
CONF-821112-	(Government microcircuit applications conference, Orlando, FL, USA, 2 Nov 1982)			
1	*See* SAND-82-0994	DE82020623	MN -32	7:63858
2	*See* SAND-82-0780/C	DE82020092	MN -25	7:63457
CONF-821113-	(4. annual Crane conference, Las Vegas, NV, USA, 19-20 Nov 1982)			
1	*See* SAND-82-1904C	DE82020561	MN -38	7:63336
CONF-821115-	(Conference of the Institute of Industrial Engineers, Louisville, KY, USA, 14-17 Nov 1982)			
1	*See* K/OA-5286	DE82021552	MN -2	7:62741
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3	NTIS, PC A04/MF A01	DE82021248	MN -88	7:62639
DOE/ET/14801-21	NTIS, PC A04/MF A01	DE82018588	STD -90d	7:62577
DOE/ET/15426-T23	NTIS, PC A03/MF A01	DE82021024	MN -95f	7:63184
T24	NTIS, PC A02/MF A01	DE83000056	MN -95f	7:63185
DOE/ET/15457-1229	NTIS, PC A04/MF A01	DE82020583	STD -90h	7:62643
DOE/ET/17091-T4	NTIS, PC A03/MF A01	DE82005424	STD -90e	7:62955
DOE/ET/20087-2	NTIS, PC A16/MF A01	DE82008816	MN -59	7:62900

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DOE/ET/20279-152	NTIS, PC A04/MF A01	DE83000062	MN -63	7:62825
199	NTIS, PC A06/MF A01	DE82022210	STD -63	7:62864
223	NTIS, PC A04/MF A01	DE82022498	STD -63	7:62820
224	NTIS MF A01	DE82022497	STD -63	7:62865
DOE/ET/20358-1	NTIS MF A01	DE82022202	MN -60	7:62944
DOE/ET/21070-T1	NTIS, PC A03/MF A01	DE82019931	MN -25	7:63270
DOE/ET/23144-81/ 1	NTIS, PC A05/MF A01	DE83000333	STD -60	7:62945
81/ 2	NTIS, PC A14/MF A01	DE83000334	STD -60	7:62946
DOE/ET/25106-T1-Vol.1	NTIS MF A01	DE82019461	MN -96	7:63092
DOE/ET/27034-T1	NTIS, PC A05/MF A01	DE82020604	MN -66a	7:62929
DOE/ET/27125-T1	NTIS, PC A07/MF A01	DE82018529	STD -66a	7:62935
DOE/ET/27146-T13	NTIS, PC A05/MF A01	DE82021796	MN -66b	7:62938
T14	NTIS, PC A03/MF A01	DE82021795	MN -66b	7:62939
T15	NTIS, PC A02/MF A01	DE82021793	MN -66b	7:62933
T16	NTIS, PC A04/MF A01	DE82021792	MN -66b	7:62934
DOE/ET/27155-1	NTIS MF A01	DE82020977	MN -66	7:62923
DOE/ET/34019-1	NTIS, PC A03/MF A01	DE82021059	MN -78	7:63002
DOE/ET/37237-16	NTIS, PC A04/MF A01	DE82021044	MN -79e	7:63009
DOE/ET/51013-54	NTIS, PC A04/MF A01	DE83000541	STD -20b	7:63822
DOE/ET/52026-7	NTIS, PC A03/MF A01	DE82022257	MN -20	7:62798
16	NTIS, PC A05/MF A01	DE82022256	MN -20	7:62799
DOE/ET/53088-45	NTIS, PC A03/MF A01	DE83000111	MN -20g	7:63783
60	NTIS, PC A03/MF A01	DE83000116	MN -20g	7:63784
64	NTIS, PC A03/MF A01	DE82021224	MN -20g	7:63785
65	NTIS, PC A03/MF A01	DE82021225	MN -20	7:63786
DOE/EV/02014-13	NTIS, PC A06/MF A01	DE82021330	MN -48	7:63547
13-Add.	NTIS, PC A03/MF A01	DE83000145	MN -48	7:63548
14	NTIS, PC A03/MF A01	DE83000144	MN -48	7:63549
17	NTIS, PC A04/MF A01	DE83000142	MN -48	7:63559
DOE/EV/03631-12	NTIS, PC A08/MF A01	DE83000054	MN -48	7:63550
DOE/EV/10019-8-Vol.2	NTIS, PC A03/MF A01	DE83001004	STD -11	7:63560
9-Vol.2	NTIS, PC A03/MF A01	DE83001006	STD -11	7:63561
DOE/EV/10253-3	NTIS, PC A07/MF A01	DE82021540	MN -69	7:63518
DOE/EV/10406-1	NTIS, PC A02/MF A01	DE83001140	MN -34	7:63475
DOE/EV/70257-T1	NTIS, PC A02/MF A01	DE82019936	MN -11	7:63565
DOE/FC/RI-82/ 4	NTIS, PC A17/MF A01	DE83000087	STD -90b	7:62623
DOE/ID/12009-T2	NTIS, PC A04/MF A01	DE82021852	MN -66a	7:62927
T3	NTIS, PC A03/MF A01	DE82021571	MN -66a	7:62928
DOE/ID/12026-T1	NTIS, PC A03/MF A01	DE82020751	MN -66	7:62930
T2	NTIS, PC A03/MF A01	DE82021739	MN -66b	7:62931
DOE/ID/12030-T2	NTIS, PC A14/MF A01	DE82020766	MN -66b	7:62924
DOE/JPL-1012-71	NTIS, PC A23/MF A01	DE83000386	STD -63b	7:62826
1060-55	NTIS, PC A03/MF A01	DE83000475	STD -62	7:62892
DOE/JPL/955533-81-7	NTIS, PC A03/MF A01	DE83000970	STD -63b	7:62827
DOE/JPL/955909-82/ 2	NTIS, PC A03/MF A01	DE82022490	STD -63b	7:62828
DOE/JPL/956705-1	NTIS, PC A02/MF A01	DE83000015	STD -63b	7:62829
DOE/LC/10446-T1	NTIS, PC A06/MF A01	DE82021250	STD -91	7:62700
DOE/MA-0081	NTIS, PC A03/MF A01	DE83000150	MN -13	7:63095
DOE/MC/05301-86	NTIS, PC A04/MF A01	DE83000029	STD -92a	7:62670
DOE/MC/16024-T3	NTIS, PC A03/MF A01	DE82021179	MN -90c	7:62578
DOE/MC/16050-1197	NTIS, PC A03/MF A01	DE82020148	STD -90e	7:63368

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DOE/MC/16377-1245	NTIS, PC A07/MF A01	DE82021319	STD -90c	7:62579
DOE/MC/16447-1239	NTIS, PC A07/MF A01	DE83000577	STD -90c	7:62580
DOE/MC/16463-T4	NTIS, PC A03/MF A01	DE82022306	MN -92a	7:62682
DOE/NBB-0008/ 1	NTIS, PC A06/MF A01	DE83000036	STD -11	7:62647
DOE/NBM-1043-Vol.2	NTIS, PC A19/MF A01	DE82021295	STD -64	7:62895
2020856	NTIS, PC A13/MF A01	DE82020856	MN -70	7:62754
2020900	NTIS, PC A13/MF A01	DE82020900	MN -70	7:62755
2021197-NY	NTIS, PC A14/MF A01	DE82021197	MN -70	7:62756
2021200-KAN	NTIS, PC A10/MF A01	DE82021200	MN -70	7:62757
2021202-FLA	NTIS, PC A11/MF A01	DE82021202	MN -70	7:62758
2021214-CA	NTIS, PC A09/MF A01	DE82021214	MN -70	7:62759
2021233-GA	NTIS, PC A09/MF A01	DE82021233	MN -70	7:62760
2022492	NTIS, PC A04/MF A01	DE82022492	MN -97	7:62997
DOE/NE/44146-T1	NTIS, PC A04/MF A01	DE82019468	MN -70	7:62761
DOE/NV/10177-2	NTIS, PC A02/MF A01	DE82020997	MN -66	7:62925
DOE/NV/10291-T1	NTIS, PC A06/MF A01	DE82020584	MN -95a	7:63179
DOE/OR/03054-5	NTIS, PC A15/MF A01	DE82008479	MN -89	7:62581
DOE/OR/20717-1-Exec.Summ.	NTIS, PC A03/MF A01	DE83000177	MN -90c	7:62592
2	NTIS, PC A08/MF A01	DE83000171	MN -90c	7:62593
3-Vol.1	NTIS, PC A99/MF A01	DE83000185	MN -90c	7:62594
3-Vol.2	NTIS, PC A22/MF A01	DE83000184	MN -90c	7:62595
4-Vol.1	NTIS, PC A22/MF A01	DE83000192	MN -90c	7:62596
4-Vol.2	NTIS, PC A18/MF A01	DE83000255	MN -90c	7:62597
4-Vol.3	NTIS, PC A18/MF A01	DE83000189	MN -90c	7:62598
4-Vol.4	NTIS, PC A11/MF A01	DE83000188	MN -90c	7:62599
4-Vol.5	NTIS, PC A12/MF A01	DE83000191	MN -90c	7:62600
4-Vol.6	NTIS, PC A11/MF A01	DE83000190	MN -90c	7:62601
4-Vol.7	NTIS, PC A12/MF A01	DE83000187	MN -90c	7:62602
5-Vol.1	NTIS, PC A13/MF A01	DE83000182	MN -90c	7:62603
5-Vol.2	NTIS, PC A20/MF A01	DE83000183	MN -90c	7:62604
5-Vol.3	NTIS, PC A17/MF A01	DE83000198	MN -90c	7:62605
5-Vol.4	NTIS, PC A11/MF A01	DE83000174	MN -90c	7:62606
6	NTIS, PC A10/MF A01	DE83000175	MN -90c	7:62607
7-Vol.1	NTIS, PC A10/MF A01	DE83000169	MN -90c	7:62608
7-Vol.2	NTIS, PC A99/MF A01	DE83000172	MN -90c	7:62609
7-Vol.3	NTIS, PC A13/MF A01	DE83000179	MN -90c	7:62610
7-Vol.4	NTIS, PC A14/MF A01	DE83000178	MN -90c	7:62611
8	NTIS, PC A10/MF A01	DE83000173	MN -90c	7:62612
9	NTIS, PC A13/MF A01	DE83000170	MN -90c	7:62613
10	NTIS, PC A11/MF A01	DE83000180	MN -90c	7:62614
11-Vol.1	NTIS, PC A11/MF A01	DE83000194	MN -90c	7:62615
11-Vol.2	NTIS, PC A13/MF A01	DE83000196	MN -90c	7:62616
11-Vol.3	NTIS, PC A04/MF A01	DE83000186	MN -90c	7:62617
11-Vol.4	NTIS, PC A19/MF A01	DE83000181	MN -90c	7:62618
11-Vol.5	NTIS, PC A24/MF A01	DE83000168	MN -90c	7:62619
DOE/PC/30088-9	NTIS, PC A03/MF A01	DE82021344	MN -90a	7:62582
DOE/PC/30293-7	NTIS, PC A04/MF A01	DE82020516	MN -90e	7:62583
DOE/PC/30296-7	NTIS, PC A06/MF A01	DE82022221	MN -90e	7:62644
DOE/PC/30298-T8	NTIS, PC A02/MF A01	DE82020992	MN -90i	7:62807
DOE/PC/30299-T5	NTIS, PC A03/MF A01	DE82021563	MN -90d	7:62681
DOE/PC/40005-20	NTIS, PC A05/MF A01	DE83000309	STD -90d	7:62584
DOE/PC/40265-5	NTIS, PC A03/MF A01	DE82021387	MN -90e	7:62645
DOE/PC/40280-T5	NTIS, PC A02/MF A01	DE82021005	MN -90h	7:63357
DOE/PC/40794-2	NTIS, PC A02/MF A01	DE82020976	MN -90h	7:63219
DOE/PC/40799-T3	NTIS, PC A03/MF A01	DE82021728	MN -90d	7:62585
DOE/PC/40809-6	NTIS, PC A02/MF A01	DE82021342	MN -90a	7:63280
T3	NTIS, PC A03/MF A01	DE82015649	MN -90a	7:63281
DOE/PC/42268-T3	NTIS, PC A02/MF A01	DE82021936	MN -90b	7:62640
DOE/PE-0029/ 1	NTIS, PC A07/MF A01	DE82022523	MN -98	7:63114
0044	NTIS, PC A03/MF A01	DE82021118	MN -13	7:63130
DOE/R4/20006-T28	NTIS, PC A02/MF A01	DE82019456	MN -97e	7:62811

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T29	NTIS, PC A02/MF A01	DE82019455	MN -97e	7:62812
T30	NTIS, PC A02/MF A01	DE82019454	MN -97e	7:62813
T31	NTIS, PC A02/MF A01	DE82019778	MN -97e	7:62814
T32	NTIS, PC A02/MF A01	DE82019779	MN -97e	7:62815
T33	NTIS, PC A02/MF A01	DE82019780	MN -97e	7:62816
T34	NTIS, PC A02/MF A01	DE82019776	MN -97e	7:62817
DOE/R5/10137-				
T1	NTIS, PC A02/MF A01	DE82019438	MN -59c	7:62910
DOE/R5/10239-				
1	NTIS, PC A02/MF A01	DE82021053	MN -61a	7:62830
DOE/RA/01699-				
T1	NTIS MF A01	DE82021385	STD -97e	7:62818
DOE/RG/10367-				
T12	NTIS, PC A04/MF A01	DE83000583	MN -13	7:63131
T13	NTIS, PC A02/MF A01	DE83000582	MN -13	7:63132
DOE/RL/02225-				
2010	NTIS, PC A02/MF A01	DE82022539	MN -11	7:63472
T11-1	NTIS, PC A05/MF A01	DE82022536	MN -22	7:63282
T11-3	NTIS, PC A06/MF A01	DE82022534	MN -22	7:63283
T11-4	NTIS, PC A05/MF A01	DE82022533	MN -22	7:63284
T11-5	NTIS, PC A02/MF A01	DE82022532	MN -22	7:63285
T17-1	NTIS, PC A02/MF A01	DE82022530	MN -34C	7:63440
DOE/RL/02227-				
T15-1	NTIS, PC A03/MF A01	DE82022529	MN -2	7:63133
DOE/RL/10236-				
81/ 1	NTIS, PC A02/MF A01	DE82020966	STD -60	7:62947
DOE/SF/01484-				
T5	NTIS MF A01	DE82008981	MN -13	7:63102
DOE/TIC-				
4581-R5	NTIS, PC A02/MF A01	DE82014313	STD -32	7:63865
DP-MS-				
82-13	NTIS, PC A03/MF A01	DE82016267	MN -80	7:63054
DPSPU-				
81-30-7	NTIS, PC A02/MF A01	DE83000680	MN -70	7:62762
81-30-8	NTIS, PC A02/MF A01	DE83000678	MN -4	7:63286
DPST-				
81-141-34	*See* GJBX-210-82	DE82021073	MN -51	7:62721
81-141-39	*See* GJBX-211-82	DE82021072	MN -51	7:62722
DTH-LV-MEDD-				
97	NTIS (US Sales Only), MF A0105/MF A01	DE82750054	MN -62	7:62920
110	NTIS (US Sales Only), MF A0104/MF A01	DE82750053	MN -59c	7:62911
ECN-				
120	NTIS (US Sales Only), MF A0109/MF A01	DE82906047	MN -90i	7:62630
EDF-R-				
81DD02007	NTIS (US Sales Only), MF A0105/MF A01	DE82702682	MN -2	7:63104
EGG-				
1183-1771	NTIS, PC A03/MF A01	DE83000931	STD -41	7:63487
2198	*See* NUREG/CR-2738		MN -78	7:63065
2209	NTIS, PC A03/MF A01	DE82021309	STD -70	7:62790
2213	NTIS, PC A04/MF A01	DE83000653	STD -66d	7:62940
EIR-				
448	NTIS (US Sales Only), MF A0103/MF A01	DE82905933	MN -78	7:63049
EPRI-CS-				
2520	NTIS, PC A10/MF A01	DE82906487	MN -90d	7:62994
2525	NTIS, PC A99/MF A01	DE82906488	MN -90d	7:62627
2528	NTIS, PC A05/MF A01	DE82906486	MN -90	7:62956
2537	NTIS, PC A04/MF A01	DE82906485	MN -90d	7:62995
EPRI-EA-				
2471	NTIS, PC A17/MF A01	DE82905839	MN -97c	7:63134
2508	NTIS, PC A07/MF A01	DE82906474	MN -11	7:63498
EPRI-NP-				
1525-Vol.5	NTIS, PC A03/MF A01	DE82906482	MN -78	7:63060
EPRI-RD-				
2369-SR	NTIS, PC A99/MF A01	DE82018875	MN -25	7:62957
ERS-E-				
276	NTIS, PC A02/MF A01			7:62694
EUR-				
7042-Pt.1-Pt.2-DE	European Community Information Service, 2100 M Street NW, Washington, DC 20037		ND -61d	7:62804
7499-EN	*See* GSF-OE-629		MN -41	7:63562
7571-EN	Commission of the European Communities, Directorate-General for Information Market and Innovation, Jean Monnet Building, Luxembourg		ND -61	7:62831
7665	D. Reidel Publishing Company, Inc., 190 Old Derby St., Hingham, MA 02043			7:62848
7689-EN	European Community Information Service, 2100 M Street, NW, Washington, DC 20037		MN -61c	7:62832
FDA-				
81-8166	NTIS, PC A99/MF A01	DE82012438	MN -48	7:63540
FE-				
2676-8	*See* DOE/ET/10112-T1	DE82019835	STD -90d	7:62622
7091-18	*See* DOE/ET/17091-T4	DE82005424	STD -90e	7:62955
FE-MIT-				
2295T26	*See* DOE/ET/10693-2295	DE83000101	MN -90a	7:62574

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FERC/EIS-0034/ D	NTIS, PC A07/MF A01	DE82021643	MN -97e	7:62819
FERMILAB/TM-1072	NTIS, PC A02/MF A01	DE83000617	MN -28	7:63461
FFA-AU-1635	NTIS (US Sales Only), MF A0104/MF A01	DE82750055	MN -60	7:62948
FOA-C-20377-A2	NTIS, PC A04/MF A01			7:63763
FSU-HEP-811201	NTIS MF A01	DE82021938	MN -34D	7:63640
FV-80-0035-01	NTIS (US Sales Only), MF A0105/MF A01	DE82750048	MN -61a	7:62833
GAO/CED-82-82	General Accounting Office, PO Box 6015, Gaithersburg, MD 20760		MN -11	7:63573
82-108	General Accounting Office, PO Box 6015, Gaithersburg, MD 20760		MN -11	7:63574
GAO/EMD-82-29	General Accounting Office, PO Box 6015, Gaithersburg, MD 20760		MN -11	7:63103
82-42	General Accounting Office, PO Box 6015, Gaithersburg, MD 20760		MN -61a	7:62834
82-53	General Accounting Office, PO Box 6015, Gaithersburg, MD 20760		MN -92	7:62690
82-74	General Accounting Office, PO Box 6015, Gaithersburg, MD 20760		MN -59	7:62901
82-112	General Accounting Office, PO Box 6015, Gaithersburg, MD 20760		MN -98B	7:62680
GAO/PLRD-82-74	General Accounting Office, PO Box 6015, Gaithersburg, MD 20760		MN -96	7:63180
82-90	General Accounting Office, PO Box 6015, Gaithersburg, MD 20760		MN -95d	7:63159
GEAP-24893	*See* EPRI-NP-1525-Vol.5	DE82906482	MN -78	7:63060
GJBX-124-82	NTIS MF A01	DE82020449	MN -51	7:62709
179-82	NTIS MF A01	DE82021667	MN -51	7:62710
180-82	NTIS MF A01	DE82021666	MN -51	7:62711
181-82	NTIS MF A01	DE82021665	MN -51	7:62712
182-82	NTIS MF A01	DE82022477	MN -51	7:62713
183-82	NTIS MF A01	DE82022504	MN -51	7:62714
184-82	NTIS MF A01	DE82022478	MN -51	7:62715
185-82	NTIS MF A01	DE82022479	MN -51	7:62716
186-82	NTIS MF A01	DE82022480	MN -51	7:62717
187-82	NTIS MF A01	DE82022481	MN -51	7:62718
188-82	NTIS MF A01	DE82022482	MN -51	7:62719
189-82	NTIS MF A01	DE82022483	MN -51	7:62720
210-82	NTIS, PC A03/MF A01	DE82021073	MN -51	7:62721
211-82	NTIS, PC A04/MF A01	DE82021072	MN -51	7:62722
213-82	NTIS MF A01	DE83000780	MN -51	7:62723
GKSS-81/ E/ 53	NTIS (US Sales Only), MF A0102/MF A01	DE82750514	MN -34C	7:63668
81/ E/ 55	NTIS (US Sales Only), MF A0102/MF A01	DE82750619	MN -80	7:63050
GSF-OE-629	Commission of the European Communities, Brussels, Belgium. Environment and Consumer Protection Service		MN -41	7:63562
GSF-S-596	NTIS (US Sales Only), MF A0103/MF A01	DE82750625	MN -80	7:63000
HEDL-SA-2574-FP	NTIS, PC A02/MF A01	DE82016262	MN -79b	7:63051
HEDL-TME-82-12	NTIS, PC A04/MF A01	DE83000106	STD -79d	7:63010
HMI-B-362	NTIS (US Sales Only), MF A0105/MF A01	DE82905946	MN -4	7:63307
IAE-3418/ 14	NTIS (US Sales Only), MF A0102/MF A01	DE82702676	MN -37	7:63787
IAEA-CN-42/ 277	NTIS, PC A02/MF A01	DE82021182	MN -79e	7:63011
IFSR-45	*See* DOE/ET/53088-45	DE83000111	MN -20g	7:63783
60	*See* DOE/ET/53088-60	DE83000116	MN -20g	7:63784
64	*See* DOE/ET/53088-64	DE82021224	MN -20g	7:63785
IFVE-ONF/FTO/PK-81-42	NTIS (US Sales Only), MF A0102/MF A01	DE82701652	MN -34D	7:63641
IITRI-M-06043-16	NTIS, PC A16/MF A01	DE82021029	STD -90c	7:62586
INDC(JAP)-66/ L	*See* NEANDC(J)-79/U		ND -34C	7:62707
INER-0447	NTIS (US Sales Only), MF A0103/MF A01	DE82906175	MN -37	7:63333
INT-154/ I	NTIS (US Sales Only), MF A0102/MF A01	DE82701845	MN -37	7:63441
IPP-Libr-67	NTIS (US Sales Only), MF A0102/MF A01	DE82905944	MN -20	7:63778

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IPPJ-				
531	NTIS, PC A02/MF A01			7:63805
532	NTIS, PC A02/MF A01			7:63624
533	NTIS, PC A02/MF A01			7:63806
534	NTIS, PC A03/MF A01			7:63826
IPPJ-REV-				
1	NTIS, PC A07/MF A01			7:63807
IS-M-				
394	NTIS, PC A02/MF A01	DE82019304	MN -34	7:63775
ISPO-				
178	*See* LA-9493-M	DE82021261	STD -15	7:63445
ITF-				
82-55P	Information Dept., Institute for Theoretical Physics 252130, Kiev-130, USSR		ND -28	7:63378
JAERI-M-				
9993	*See* NEANDC(J)-79/U		ND -34C	7:62707
JINR-R-				
3-81-667	NTIS (US Sales Only), MF A0102/MF A01	DE82702677	MN -37	7:63442
JPL-PUBL-				
82-15	*See* DOE/ET/12548-14	DE83000451	STD -88	7:62637
82-48	*See* DOE/JPL-1012-71	DE83000386	STD -63b	7:62826
82-70	*See* DOE/JPL-1060-55	DE83000475	STD -62	7:62892
Juel-				
1731	NTIS (US Sales Only), MF A0110/MF A01	DE82750499	MN -77	7:63005
1733	NTIS (US Sales Only), MF A0103/MF A01	DE82750615	MN -10	7:62745
1742	NTIS (US Sales Only), MF A0103/MF A01	DE82750618	MN -11	7:63476
Juel-Conf-				
40	NTIS (US Sales Only), MF A0108/MF A01	DE82750636	MN -2	7:62769
45	Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe, Germany, F.R.			7:63390
Juel-Spez-				
90	NTIS (US Sales Only), MF A0105/MF A01	DE82750613	MN -62	7:62912
136(Bd.1)	NTIS (US Sales Only), MF A0113/MF A01	DE82750635	MN -77	7:63061
K/CSD/INF-				
82/ 6	NTIS, PC A02/MF A01	DE82012817	MN -59c	7:63160
82/ 6-R1	NTIS, PC A02/MF A01	DE82018350	MN -59c	7:63161
K/OA-				
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K/TL/AT-				
142	NTIS, PC A02/MF A01	DE83000052	MN -4	7:63287
KFK-				
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3220	NTIS (US Sales Only), MF A0103/MF A01	DE82750515	MN -34C	7:63724
3233	NTIS (US Sales Only), MF A0103/MF A01	DE82750513	MN -34C	7:63663
3236	NTIS (US Sales Only), MF A0103/MF A01	DE82750626	MN -4	7:63288
3238	NTIS (US Sales Only), MF A0103/MF A01	DE82750511	MN -34C	7:63443
3247	NTIS (US Sales Only), MF A0102/MF A01	DE82750501	MN -25	7:63220
3261	NTIS (US Sales Only), MF A0103/MF A01	DE82750516	MN -34C	7:63761
KFK-CAD-				
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KGI-PREPRINT-				
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LA-				
9351	NTIS, PC A03/MF A01	DE82021173	STD -34C	7:63444
9363-LLWM	NTIS, PC A02/MF A01	DE82021172	STD -70	7:63507
9396-MS	NTIS, PC A03/MF A01	DE82021265	STD -70	7:62770
9436-MS	NTIS, PC A04/MF A01	DE82021255	STD -79p	7:63062
9449-MS	NTIS, PC A03/MF A01	DE83000467	STD -15	7:62794
9454-MS	NTIS, PC A02/MF A01	DE82021254	STD -28	7:63399
9455-MS	NTIS, PC A02/MF A01	DE82021258	STD -28	7:63381
9468-PR	NTIS, PC A05/MF A01	DE83000457	STD -34C	7:63647
9474-PR	NTIS, PC A03/MF A01	DE83000464	STD -59c	7:62902
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9491-PR	NTIS, PC A02/MF A01	DE82021262	STD -11	7:62771
9493-M	NTIS, PC A02/MF A01	DE82021261	STD -15	7:63445
9494-MS	NTIS, PC A02/MF A01	DE82021256	STD -15	7:62795
9508-MS	NTIS, PC A06/MF A01	DE83000473	STD -48	7:63533
LA-UR-				
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82-1483	NTIS, PC A02/MF A01	DE82015803	MN -78	7:63063
82-2323	NTIS, PC A02/MF A01	DE82021768	MN -70	7:62772
82-2333	NTIS, PC A02/MF A01	DE82021770	MN -34B	7:63576
82-2343	NTIS, PC A02/MF A01	DE82021773	MN -34	7:63629
82-2346	NTIS, PC A02/MF A01	DE82021774	MN -34B	7:63616
82-2349	NTIS, PC A02/MF A01	DE82021777	MN -34B	7:63577
82-2351	NTIS, PC A04/MF A01	DE82021778	MN -34A	7:63771
82-2417	NTIS, PC A02/MF A01	DE82021884	MN -32	7:63359
82-2424	NTIS, PC A02/MF A01	DE82021885	MN -22	7:63354
82-2425	NTIS, PC A02/MF A01	DE82021889	MN -22	7:63355
82-2430	NTIS, PC A02/MF A01	DE82021892	MN -22	7:63317
82-2452	NTIS, PC A02/MF A01	DE82021893	MN -22	7:63318
82-2481	NTIS, PC A02/MF A01	DE82021900	MN -34C	7:63400
82-2482	NTIS, PC A02/MF A01	DE82021766	MN -21	7:63827
82-2590	NTIS, PC A02/MF A01	DE83000330	MN -10	7:63289
82-2622	NTIS, PC A02/MF A01	DE83000332	MN -34D	7:63655

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14247	NTIS, PC A02/MF A01	DE82014473	MN -80	7:63064
14563	NTIS, PC A07/MF A01	DE82020337	MN -34C	7:63713
14626	NTIS, PC A03/MF A01	DE83001226	STD -95d	7:63162
14651	NTIS, PC A02/MF A01	DE82018778	MN -95f	7:63163
14788	NTIS, PC A02/MF A01	DE82021789	MN -95d	7:63164
LIS-				
17	Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe, Germany, F.R.			7:63477
LMF-				
93	NTIS, PC A04/MF A01	DE83000382	STD -48	7:63478
LUTMDN/TMVK-				
3097/ 1-40/ (1981)	NTIS (US Sales Only), MF A0104/MF A01	DE82750043	MN -61a	7:62809
LUTVDG/(TVBH-				
1003) / 1-165/ (1981)	NTIS (US Sales Only), MF A0108/MF A01	DE82750066	MN -95d	7:63165
METC/EGSP-				
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MHSMP-				
82-31	NTIS, PC A02/MF A01	DE82022475	MN -45	7:63467
82-32	NTIS, PC A02/MF A01	DE82022476	MN -45	7:63468
MIT-				
R82-44	NTIS, PC A17/MF A01	DE83000202	MN -90h	7:62587
MLM-				
2959	NTIS, PC A02/MF A01	DE82022473	STD -4	7:63324
2961-OP	NTIS, PC A02/MF A01	DE82019174	MN -16	7:63290
2969	NTIS, PC A02/MF A01	DE82021902	STD -70	7:62773
2981	NTIS, PC A03/MF A01	DE82021904	STD -15	7:63291
2982-OP	NTIS, PC A03/MF A01	DE82019274	MN -20	7:63828
2990-OP	NTIS, PC A02/MF A01	DE82021346	MN -4	7:63308
3000(OP)	NTIS, PC A04/MF A01	DE82021293	MN -34	7:63309
MPIS-				
9/ 1980	NTIS, PC A10/MF A01			7:63625
26/ 1979	NTIS, PC A05/MF A01			7:63626
MPQ-				
53	NTIS (US Sales Only), MF A0102/MF A01	DE82905935	MN -20	7:63808
MSNW-				
1110	*See* DOE/ET/52026-7	DE82022257	MN -20	7:62798
N-				
82-16109	NTIS, PC A16/MF A01			7:63578
82-16967	NTIS, PC A09/MF A01			7:63579
82-16970	NTIS, PC A09/MF A01			7:63580
82-16971	NTIS, PC A09/MF A01			7:63581
82-16973	NTIS, PC A09/MF A01			7:63582
82-16974	NTIS, PC A02/MF A01			7:63583
82-16976	NTIS, PC A08/MF A01			7:63584
82-16979	NTIS, PC A08/MF A01			7:63585
82-16997	NTIS, PC A08/MF A01			7:63586
82-16999	NTIS, PC A08/MF A01			7:63587
82-17005	Academy of Sciences, Moscow, USSR			7:63588
82-17016	NTIS, PC A13/MF A01			7:63589
82-17017	NTIS, PC A13/MF A01			7:63590
82-17018	NTIS, PC A13/MF A01			7:63591
82-17019	NTIS, PC A13/MF A01			7:63592
82-17020	NTIS, PC A13/MF A01			7:63593
82-17021	NTIS, PC A13/MF A01			7:63594
82-17022	NTIS, PC A13/MF A01			7:63595
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82-17062	NTIS, PC A25/MF A01			7:63610
82-17064	NTIS, PC A25/MF A01			7:63611
82-116975	NTIS, PC A08/MF A01			7:63612
NASA-CASE-GSC-				
12640-1	NTIS, PC A02/MF A01			7:63462
NASA-CP-				
2191	NTIS, PC A13/MF A01			7:63613
NASA-CR-				
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165485	NTIS, PC A04/MF A01			7:62836
165508	NTIS, PC A04/MF A01			7:63093

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NASA-TM-				
76626	NTIS, PC A03/MF A01			7:63575
76628	NTIS, PC A03/MF A01			7:63566
82685	NTIS, PC A02/MF A01			7:62837
NE/BIO-				
81/ 17	NTIS (US Sales Only), MF A0103/MF A01	DE82750049	MN -61a	7:62838
81/ 21	NTIS (US Sales Only), MF A0104/MF A01	DE82750044	MN -61a	7:62810
81/ 22	NTIS (US Sales Only), MF A0103/MF A01	DE82750050	MN -61a	7:62839
NE-E-				
15-2NB-T-3-82-Rev.	Nuclear Standards Management Center, Oak Ridge, TN 37830		STD -80	7:63039
15-2NC-T-3-82-Rev.	Nuclear Standards Management Center, Oak Ridge, TN 37830		STD -80	7:63038
NE-F-				
3-41T-12-81	Nuclear Standards Management Center, Oak Ridge, TN		STD -80	7:63037
NE-M-				
1-5T-4-82-Rev.	Nuclear Standards Management Center, Oak Ridge, TN 37830		STD -80	7:63026
1-6T-Rev.-8-82	Nuclear Standards Management Center, Oak Ridge, TN 37830		STD -80	7:63023
1-21T-3-82-Rev.	Nuclear Standards Management Center, Oak Ridge, TN 37830		STD -80	7:63027
2-3T-Rev.-8-82	Nuclear Standards Management Center, Oak Ridge, TN 37830		STD -80	7:63024
2-5T-Rev.-8-82	Nuclear Standards Management Center, Oak Ridge, TN 37830		STD -80	7:63025
2-21T-4-82	Nuclear Standards Management Center, Oak Ridge, TN 37830		STD -80	7:63221
3-4T-Rev.-9-82	Nuclear Standards Management Center, Oak Ridge, TN 37830		STD -80	7:63020
3-33T-Rev.-9-82	Nuclear Standards Management Center, Oak Ridge, TN 37830		STD -80	7:63019
6-3T-Rev.-9-82	Nuclear Standards Management Center, Oak Ridge, TN 37830		STD -80	7:63021
6-4T-Rev.-9-82	Nuclear Standards Management Center, Oak Ridge, TN 37830		STD -80	7:63022
NE/TORV-				
81/ 5	NTIS (US Sales Only), MF A0105/MF A01	DE82750051	MN -90	7:62620
NE/VIND-				
80/ 39	NTIS (US Sales Only), MF A0104/MF A01	DE82750056	MN -60	7:62949
81/ 4	NTIS (US Sales Only), MF A0102/MF A01	DE82750057	MN -60	7:62950
81/ 5	*See* FFA-AU-1635	DE82750055	MN -60	7:62948
NEANDC(J)-				
79/ U	Information Section, Division of Technical Information, Japan Atomic Energy Research Institute, Tokai-mura, Naka-gun, Ibaraki-ken 319-11, Japan		ND -34C	7:62707
NP-				
27500XX	NTIS (US Sales Only), MF A0103/MF A01	DE82750060	MN -94a	7:62921
27500XX	NTIS (US Sales Only), MF A0106/MF A01	DE82750061	MN -98	7:62998
27500XX	NTIS (US Sales Only), MF A0103/MF A01	DE82750074	MN -90i	7:63186
2018198	Governor's Energy Office, 301 Farris Bryant Building, 620 S. Meridian St., Tallahassee, FL 32304		MN -95	7:63119
2750047	NTIS (US Sales Only), MF A0103/MF A01	DE82750047	MN -61a	7:62840
2902386	NTIS (US Sales Only), PC A	DE82902386	MN -13	7:63208
2902390	NTIS (US Sales Only), MF A0105/MF A01	DE82902390	MN -60	7:62951
2903423	NTIS (US Sales Only), MF A0103/MF A01	DE82903423	MN -2	7:63106
2903876	Kernforschungsanlage Juelich GmbH, Postfach 1913,517 Juelich, Germany		ND -2	7:63105
2904393	NTIS (US Sales Only), MF A0103/MF A01	DE82904393	MN -38	7:63360
2904683	Bundesanstalt fuer Materialpruefung		ND -38	7:63361
2904703	Wood Heating Alliance, 1101 Connecticut Avenue, N.W., Suite 700, Washington, DC 20036			7:63169
2905312	H.K. van Poollen and Associates, Inc., 1100 W. Littleton Blvd., Littleton, CO 80120		MN -92a	7:62671
2905796	NTIS (US Sales Only), MF A0105/MF A01	DE82905796	MN -90	7:63127
2905797	NTIS (US Sales Only), MF A0103/MF A01	DE82905797	MN -4	7:63089
2905798	NTIS (US Sales Only), MF A0102/MF A01	DE82905798	MN -95d	7:63177
2906028	NTIS, PC A04/MF A01		MN -66	7:63569
2906029	NTIS, PC A03/MF A01	DE82906029	MN -88	7:62634
2906030	NTIS, PC A05/MF A01	DE82906030	MN -61a	7:62841
2906049	California Energy Resources Conservation and Development Commission, 1111 Howe Ave., Sacramento, CA 95825		MN -95a	7:63166
2906050	NTIS, PC A03/MF A01	DE82906050	MN -61a	7:62842
2906139	NTIS (US Sales Only), MF A0105/MF A01	DE82906139	MN -92	7:63097
2906140	NTIS (US Sales Only), MF A0105/MF A01	DE82906140	MN -92	7:62648
2906141	NTIS (US Sales Only), MF A0104/MF A01	DE82906141	MN -90	7:62646
2906143	NTIS (US Sales Only), MF A0103/MF A01	DE82906143	MN -41	7:63563
2906144	NTIS (US Sales Only), MF A0103/MF A01	DE82906144	MN -41	7:63503
2906145	NTIS (US Sales Only), MF A0103/MF A01	DE82906145	MN -41	7:63504
2906146	NTIS (US Sales Only), MF A0104/MF A01	DE82906146	MN -41	7:63564
2906147	NTIS (US Sales Only), MF A0110/MF A01	DE82906147	MN -90	7:62588
2906471	H.M.S.O., London, England, 6.20 pou			7:63182
82903837	NTIS (US Sales Only), MF A01	DE82903837	MN -2	7:63850
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2904692	NTIS (US Sales Only), MF A0102/MF A01	DE82904692	MN -92b	7:62695

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NRL-MR-				
4860	NTIS, PC A02/MF A01	DE82022213	STD -21	7:63829
4882	NTIS, PC A02/MF A01	DE82021075	MN -21	7:63809
4916	NTIS, PC A02/MF A01	DE82022075	STD -21	7:63830
NTISUB/A/024-				
75/ 001	NTIS		MN -62	7:62903
75-003	NTIS		MN -62	7:62904
75/ 004	NTIS		MN -62	7:62905
NTISUB/B/024-				
76/ 001	NTIS		MN -62	7:62906
76/ 002	NTIS		MN -62	7:62907
NUREG-				
0877	GPO$5.50		MN -80	7:63047
NUREG/BR-				
0024	GPO		MN -41	7:63554
NUREG/CR-				
1846	*See* EPRI-NP-1525-Vol.5	DE82906482	MN -78	7:63060
2731	NTIS- GPO $4.75		MN -70	7:62775
2738	NTIS PCE04/MF A01		MN -78	7:63065
2823	NTIS, PC A06/MF A01		MN -11	7:63519
2824-Vol.1	NTIS, PC A02/MF A01 - GPO		MN -78	7:63003
2844	NTIS, PC A06/MF A01 - GPO		MN -98E	7:63028
2855	GPO$6.50		MN -78	7:63066
2873-Vol.1	GPO$9.50		MN -41	7:62791
2922	GPO$4.50		MN -79p	7:63067
NUS-				
3789	*See* DOE/NBM-2021214-CA	DE82021214	MN -70	7:62759
NZERDC-P-				
9	NTIS (US Sales Only), MF A0104/MF A01	DE82904645	MN -62	7:62908
ONWI-				
199	NTIS, PC A03/MF A01	DE83000732	MN -70	7:62776
201	NTIS, PC A04/MF A01	DE83000731	MN -70	7:62777
278	NTIS, PC A02/MF A01	DE83000742	MN -70	7:63568
ORNL-				
5917	NTIS, PC A07/MF A01	DE83000378	MN -70	7:62778
ORNL/CON-				
71	NTIS, PC A04/MF A01	DE82021109	MN -95d	7:63167
ORNL/CSD-				
104	NTIS, PC A03/MF A01	DE83000220	STD -32	7:63855
ORNL/CSD/TM-				
185	NTIS, PC A04/MF A01	DE83000221	STD -34A	7:63627
193	NTIS, PC A02/MF A01	DE83000423	MN -78	7:63068
ORNL/TM-				
8060	NTIS, PC A02/MF A01	DE83000379	STD -77	7:63006
8219/ R1	NTIS, PC A02/MF A01	DE83000381	STD -97d	7:62992
8324	*See* NUREG/CR-2844		MN -98E	7:63028
8359	NTIS, PC A06/MF A01	DE83000377	MN -11	7:63515
8418-Vol.1	*See* NUREG/CR-2824-Vol.1		MN -78	7:63003
8513	NTIS, PC A02/MF A01	DE83000422	MN -94	7:63207
ORNL-tr-				
4859	NTIS, PC A02/MF A01	DE83000759	MN -48	7:63506
4892	NTIS, PC A02/MF A01	DE83000247	MN -11	7:63510
4897	NTIS, PC A02/MF A01	DE83000024	MN -11	7:63511
4905	NTIS, PC A02/MF A01	DE82022173	MN -11	7:63512
ORO-				
3106-79	*See* DOE/ER/03106-79	DE82021941	MN -4	7:63323
3631-12	*See* DOE/EV/03631-12	DE83000054	MN -48	7:63550
P-				
300-82-008	California Energy Commission, 1111 Howe Avenue, Sacramento, CA 95825		MN -98E	7:63135
400-82-054	California Energy Commission, 1111 Howe Ave., Sacremento, CA 95825		MN -95a	7:63168
PATENTS-US-	(US: Commissioner of Patents, Washington, D.C. 20231, USA, $1.00 per copy. Government Patent Applications available from NTIS)			
A 335,996		DE82020863		7:63366
PB-				
81-212037	NTIS, PC A12/MF A01			7:63520
81-218117	NTIS, PC A03/MF A01			7:63479
81-218273	NTIS, PC A06/MF A01			7:63480
81-219594	NTIS, PC A04/MF A01			7:62589
81-220048	NTIS, PC A24/MF A01			7:62631
81-221863	NTIS, PC A05/MF A01			7:63505
81-225773	NTIS, PC A14/MF A01			7:62996
81-226078	NTIS, PC A11/MF A01			7:63481
82-100538	NTIS, PC A07/MF A01			7:63181
PFC/RR-				
82-25	*See* DOE/ET/51013-54	DE83000541	STD -20b	7:63822
PGJ/F-				
001-82	NTIS PCE07/MF $6.50	DE82021096	MN -51	7:62724
008-82	NTIS PCE07/MF $6.00	DE82021095	MN -51	7:62725
012-82	NTIS PCE09/MF $6.20	DE82022286	MN -51	7:62726
013-82	NTIS PCE07/MF $4.50	DE82022284	MN -51	7:62727
014-82	NTIS PCE07/MF $4.40	DE82021152	MN -51	7:62728
024-82	NTIS PCE07/MF $4.20	DE82021150	MN -51	7:62729

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051-82	NTIS PCE06/MF $4.40	DE82021093	MN -51	7:62730
053-82	NTIS PCE08/MF $4.80	DE82021151	MN -51	7:62731
075-82	NTIS PCE09/MF $5.80	DE82021153	MN -51	7:62732
076-82	NTIS PCE07/MF A01	DE82020956	MN -51	7:62733
095-82	NTIS PCE09/MF A01	DE82021653	MN -51	7:62734
100-82	NTIS PCE07/MF A01	DE82021154	MN -51	7:62735
103-82	NTIS PCE07/MF A01	DE82020967	MN -51	7:62736
104-82	NTIS PCE06/MF A01	DE82021098	MN -51	7:62737
137-82	NTIS PCE04/MF A01	DE82021654	MN -51	7:62738
138-82	NTIS PCE05/MF $4.60	DE82021155	MN -51	7:62739
PNE-				
82-153	*See* DOE/ET/37237-16	DE82021044	MN -79e	7:63009
PNL-				
3795	NTIS, PC A03/MF A01	DE82019253	MN -70	7:62779
3986	NTIS, PC A03/MF A01	DE82022212	MN -70	7:63292
4189	NTIS, PC A08/MF A01	DE82022209	MN -85	7:62747
4260	NTIS, PC A05/MF A01	DE82022521	MN -94e	7:63088
4299	NTIS, PC A05/MF A01	DE83000661	MN -70	7:62780
4306-Vol.1	*See* NUREG/CR-2873-Vol.1		MN -41	7:62791
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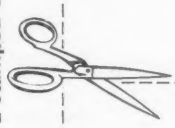

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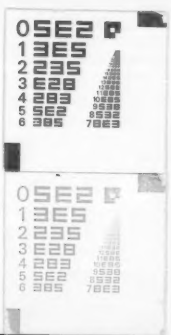
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